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NUMERICAL FORECASTING OF
CLEAR AIR TURBULENCE

MICHAEL JOSEPH ETTTEL
and
WILLIAM ALLEN MORGAN

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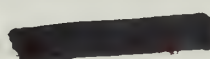
CLEAR AIR TURBULENCE

by

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requirements for the degree of

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ABSTRACT

There is much disagreement as to (a) what causes clear air turbulence (turbulence which is not in or near convective clouds and is above 15,000 feet in altitude) and (b) which meteorological parameters can be used to detect and forecast its occurrence. The approach to this problem has been to relate not one parameter to clear air turbulence but various parameters. By summing these parameters areas can be defined where there is a high probability of encountering clear air turbulence. Each parameter has been based on a statistical study which found a relationship with clear air turbulence. The parameters used were horizontal and vertical shear, curvature, kinetic energy and their derivatives.

The numerical forecasting program proposed here can be extended to the stratosphere when more reliable height and temperature fields are available. This program will have much more significance when intermediate forecast height fields, temperature fields and a grid of much smaller mesh length are available.

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1. INTRODUCTION

The phenomenon of clear air turbulence (henceforth denoted as CAT) appears to consist of random three dimensional eddies that occur in certain confined regions of the atmosphere. This phenomenon was first recognized in the early 1940's as "air pockets", and has gained in importance and depth of study with the development of fast-flying swept wing and delta winged aircraft. It is of prime importance to the aviation industry because it affects the safety and comfort of passengers and crew, as well as operational costs. There have been several cases where loss of control of aircraft, structural damage, passenger and crew injuries (even deaths) have resulted from CAT.

Aircraft manufacturers and the airlines are interested in CAT in order to determine the strength of airframe design so that it can be built to withstand all degrees of turbulence. Planning of supersonic transport aircraft is considering the effects of this unexpected turbulence occurring at any flight level in the atmosphere. Therefore, it becomes an even greater operational problem in the era of future design of SST aircraft as to cost, safety and comfort. CAT is usually less intense than turbulence encountered in thunderstorms 1 . CAT may be considered at times more dangerous than "thunderstorm turbulence" as it usually occurs with no visible warning.

The various military agencies are deeply concerned with the understanding of CAT and its prediction so they may be better prepared to take it into account operationally in all areas of the world. Scientists are highly interested in CAT because it is a phenomenon of our environment that is not clearly understood. We are faced with the problem of having to rely on mesoscale data while the phenomenon is of a microscale. Because of the great differences in scales involved in the forecasting

problem, isolated patches of CAT (in either space or time) are very difficult to identify. It is the intent of this paper to develop a numerical forecasting system of CAT whereby an empirical approach has been used to accomplish this end.

2. DATA COLLECTION

The nature of clear air turbulence, its physics and its meteorology, are still not completely understood. More mesoscale (2km to 100km horizontal distance) and microscale (less than 2km) studies must be made concerning the causes and generation of CAT. Any improvement in forecasting skill that may be realized by this study will probably result from increased mesoscale input data into the forecast problem. The only mesoscale measurements available operationally at this time which concern the problem are rawinsonde data that give a nearly continuous measurement in the vertical of wind, pressure, temperature and humidity from the surface to above 30km in altitude, and satellite cloud pictures that delineate cloud structures down to a scale of about 3km.

The usual definition of CAT is "atmospheric turbulence which is not in or near convective clouds, including thunderstorms, and is not below 15,000 feet in altitude". (4) Thus, mechanical turbulence induced by rough terrain is excluded. It is realized that this is an extremely arbitrary definition resulting from a desire to simplify pilot reporting procedures.

Turbulence intensities are, at present, designated as light, moderate, severe and extreme. In recent years several definitions of the four categories of turbulence have been proposed. The current definitions in official use were developed by the National Advisory Committee for Aeronautics (NACA) Subcommittee on Meteorological Problems (1957). See Table 1.

There are few quantitative measurements of atmospheric turbulence at any scale. The bulk of the aircraft turbulence data available is based upon the four categories stated in Table 1, (4) ; and, consequently is highly subjective and qualitative in nature. Included in the factors that affect the subjective decision of the pilot when reporting turbulence are the wing loading, the aircraft's speed and attitude, the pilot's training, experience, and his psychological reactions (1) .

Objective criteria for turbulence reporting must wait until more measurements are made of the conditions existing in the turbulent eddies, and until cockpit instrumentation includes a gust load or turbulence indicator.

Much time, effort and financial support have been expended in this country by the government, the aircraft industry, and private and public research facilities to investigate the problem of clear air turbulence and to find a good approach leading to a solution to this problem. This research has gone forward in three broad categories: first, research concerning the correlation of CAT with macroscale, mesoscale, and/or microscale atmospheric measurements; second, research into instrumentation for the detection of CAT sufficiently far in advance of the aircraft to allow evasive measures (6) and third, research by military and airline organizations concerning the operational aspects of CAT.

Various projects such as HICAT, ALLCAT, and TOPCAT have been undertaken to study clear air turbulence. The problems encountered were many but the results showed that it was indeed possible, with suitable instrumentation, to find, track and record CAT. The use of constant level balloons and doppler radar to detect CAT has met with some success, but again the lack of detail necessary in CAT studies leaves much to be desired.

Measurements of the microstructure, which contains the perturbations of CAT dimensions (100 to 500 meter wavelength), have been taken by specially instrumented aircraft. Until recently the aircraft itself was used as a sensor to measure atmospheric gusts from the aircraft acceleration data. The Air Force realized the danger of relying solely on the acceleration response of the U-2 aircraft as a measure of turbulence at high altitudes. A full knowledge of the aircraft's response to turbulence over a wide range of wavelengths is required for meaningful interpretation of such data. This procedure usually gives reliable results at short wavelengths up to a few hundred meters. At long wavelengths, this instrumentation becomes less sensitive. Accelerations in longer waves are usually small and can be masked by pilot induced aircraft motions.

A supersonic or hypersonic craft of some radical shape, flying four to ten times the speed of the U-2, will obviously have a somewhat different response to turbulence than the U-2. An aircraft flying at these high speeds would be affected much more by longer turbulence wavelengths and less by the shorter.

As pointed out earlier, the meteorologist has few direct measurements of turbulence intensities and must depend upon the accuracy of the intensities reported by pilots. In our study, we used the Colson monthly turbulence summaries which were obtained from the Air Force 3rd Weather Wing at Offutt AFB, Omaha, Neb. This report suited our needs most closely because the CAT reports were detailed as to location, time, altitude and intensity. In the period used in our study, December 1964 through March 1965, there were no less than 3670 CAT reports. The

reports were located over the United States and extended from about 15,000 feet to over 45,000 feet. The data were collected from military, civilian and private aircraft. They are, as mentioned before, quite subjective.

In the course of this paper three time periods or intervals will be used. It is important to establish at this point which periods were used and for what purpose.

A four month period (December 1964 through March 1965) is used for the research program during which several fields were constructed. Patterns of fields of different meteorological parameters were sometimes similar. Then all but one of them were dropped in our further investigations. In this way only three of the original seven parameters were retained.

The three day period (10 - 12 March, 1965) was used for a verification or correlation study. During this period of time a comparison was made to find out how many times CAT actually occurred in areas where it was predicted.

Finally, 23 February 1965 was arbitrarily chosen from the four month period and used only for illustrating the various fields and parameters used in the research program.

3. THE CLEAR AIR TURBULENCE STUDY

Clear air turbulence (CAT) is a microscale phenomenon (less than 2 kilometers in horizontal extent) but the conditions which are symptomatic of its existence are of synoptic scale. Therefore, synoptic scale parameters may be used to determine areas where CAT could occur, that is forecasting areas where there is a high probability of CAT.

From various reports and their contradictions it appears that no single parameter can detect CAT. Certain parameters can detect the possibility of CAT in some synoptic situations but fail in others.

The approach used in this paper was to take statistical studies made by previous investigators and to use the basic parameters which they related to CAT (2,3,5,7,8). If the magnitude of any one parameter becomes large or the sum of various parameters becomes large then there is a high probability of CAT in that area. Therefore, the problem is not one of forecasting actual CAT but rather to forecast areas of high and low probability of encountering CAT. In this way flights may be planned so as to expect least CAT.

The research program consisted of computing the equations shown in Appendix A. These equations were computed using the CDC 1604 digital computer. The program was written utilizing symbolic coded relocatable assembly program (SCRAP). It was necessary to use fixed point fractional numbers in order that Fleet Numerical Weather Facility (FNWF) subroutines could be used. All finite differences were computed using standard FNWF mesh length of 381 kilometers true at 60 degrees north latitude. There are no time derivatives in the program. The research reported here is accomplished using analytical fields. Operational use would employ

forecast fields. Results would naturally not have been as good as the forecast fields were used in this research. "Prog 24 hours" print out at the bottom of each field represents the practical forecast interval to be used operationally.

The research program was written to compute CAT in three layers 500 to 300, 300 to 200, and 200 to 100 millibars. Computations were not made for the third layer since 100 millibar fields were not available.

The research program was written to compute on the entire 63 x 63 FNWF grid of the northern hemisphere. A boundary condition of zero was used for the outside rows and columns. The print routines are 22 x 22 extracts of the United States starting at FNWF grid point J008, I018. The latitude and longitude coordinates of the four corners of the printed fields starting with the lower left corner proceeding clockwise are: 9.1N 109.5W, 44.5N 165.5W, 57.7N 3.1E, 13.0N 58.8W.

All printed fields are pure numbers and have no dimensional meaning. All scaled outputs have been shifted to the left end of the register and the first three numbers with sign bit are printed out in decimal. Grid points can take on values from -999 to +999 except those fields which have been made all positive. The decimal point does not appear on the printed fields. Therefore, the printed grid point values are from -999 to +999.

In the research program the capital letters refer to the parameter as computed from the data. The small case letters serving as exponents represent the number of times and direction the register has to be shifted in order to place the significant portion into the first three numbers. Therefore, the two with exponents represent the scaling coefficient. Since the computations were in fixed point fraction, all

printouts had to be shifted so as not to exceed one at any grid point in the field. Exceeding one would result in a meaningless value at that particular grid point. In addition the entire field had to be kept large enough so that patterns could exist and not be at or near zero throughout the field. Since these fields are summed they must be small enough so as not to cause the summation field to exceed one at any grid point.

The research program was run for thirty-six days during December 1964 and January, February, and March 1965. The thirty-six days were chosen because they were the most active in CAT reports during the four month period. In other words, there were more reports by pilots encountering CAT on these particular days. In order to show an example of each field printed out by the research program the time 00Z 23 FEB 65 was arbitrarily selected. These fields appear in Appendix C. Each field was produced by an individual term which will be described as follows:

THE FIRST TERM OF THE RESEARCH PROGRAM (APPENDIX A)

The First Term is $2^a A$ where A is the Laplacian of absolute vorticity. When this term is negative there is a local maximum of absolute vorticity meaning it is larger at that grid point than the average of the surrounding grid points. Therefore, the cyclonic curvature or cyclonic shear or both are relatively large at that grid point. This should correspond to the cold side of the jet especially in troughs. According to Endlich and McLean (1) there is a greater percentage of CAT on the cold side of the jet. Also according to Harrison (2) there is a strong tendency for moderate to severe CAT to be associated with trough lines.

This term was computed for the layer by first calculating the absolute vorticity of the upper and lower level D fields. The Laplacian was then taken of each field and a vertical average made of the upper and lower levels to obtain the Laplacian of vorticity of the layer.

This parameter has depicted most of the CAT associated with the trough over the western United States. The severe CAT near New Orleans is in an area of very large negative numbers. The field is contoured at intervals of 100 with the origin at zero.

THE SECOND TERM

The Second Term is $2^b B$ where B is the absolute value of the vertical change in the vector thermal wind. One of the parameters which Lake's (7) statistical testing indicated was associated with CAT was the vertical gradient of wind shear. As shown by Richardson (9) the thermal wind shear is proportional to the gradient of static stability.

The u and v components of the thermal wind were computed from the upper and lower level temperature fields. The difference between the upper and lower level values of the u component was found and each difference was squared. This was also done for the v component. The square root of the sum of the squared differences gives the magnitude of the vector difference. According to Endlich and McLean (3) the largest values of the thermal wind shear appear on the warm side of the jet. This was found to be true throughout the four months. The contour interval for this field is 25 and the origin is zero.

THE THIRD TERM

The Third Term is $2^c C$ where C is one half the geostrophic wind velocity squared. C therefore represents the specific kinetic energy or in other words the kinetic energy per unit mass.

Clem (2) found that most cases of moderate to severe CAT were associated with areas of isotach maxima.

This term was computed for the layer by calculating the u and v components of the geostrophic wind at the upper and lower levels. The upper and lower level u components were vertically averaged to obtain an average u component for the layer. The average v component for the layer was obtained by a similar process. The magnitude of the velocity squared is just the sum of the squared components.

In the research program this field is contoured at intervals of 100 with the origin at zero. Contoured at this interval the kinetic energy field clearly depicts the isotach maxima regions. The kinetic energy field in Appendix C shows this field depicting the CAT in the western part of the United States occurring in areas of relatively large wind speeds. The kinetic energy field fails to indicate the severe CAT near New Orleans because it occurs in an area of relatively light winds.

THE FOURTH TERM

The Fourth Term is $2^d D$ where D is the absolute value of the derivative of the kinetic energy with respect to pressure.

Lake's (7) statistical testing indicated that the gust intensities are related to the vertical gradients of horizontal kinetic energy. This term was computed for the layer by first calculating the velocity squared at the upper and lower levels. The vertical gradient for the layer was then obtained by computing the difference between the upper and lower level values of the velocity squared. The absolute value was taken so as to have all values positive. CAT should be associated with

large values of this field. Large values of this field were found only in areas of large values of kinetic energy. This field was therefore redundant and was eliminated from the CAT forecast program. The contour interval was 100 with the origin at zero.

THE FIFTH TERM

The Fifth Term is $2^e E$ where E is the absolute value of the Laplacian of kinetic energy. The statistical survey made by Endlich and McLean (3) shows the maximum occurrence of CAT along the edges of the isotach maxima. The Laplacian of kinetic energy shows large horizontal changes in kinetic energy, both positive and negative. Therefore the absolute value of the term is taken in order to give only positive numbers. The contour interval was 25 with the origin at zero.

This term was introduced to depict the areas of large horizontal change in kinetic energy. However, there was no relationship with reported CAT. This field was therefore eliminated from the CAT forecast program.

THE SIXTH TERM

At this point in the research program it was necessary to sum the first five terms due to computer memory space. This term, referred to as KAT1, was the Sixth Term. The contour interval was 250 with the origin at zero. It was found that this term did not supply significantly new information since it was dominated by the kinetic energy and the two associated terms.

THE SEVENTH TERM

The Seventh Term is $2^f F$ where F is the Jacobian of temperature and omega (component of the wind normal to the pressure surface). This

term was developed by Dr. Moore of Douglas Aircraft and Dr. Krishnamurti (8). The latter was associated at that time with the University of California, Los Angeles and consultant to Douglas Aircraft. The term was developed as the Jacobian of temperature and three dimensional divergence. As shown in their paper this is proportional to the negative of the Jacobian of temperature and omega. This term was computed for the lower level of each layer in the research program. The contour interval for this term was 100 with the origin at zero. In this program no significant relationship was found with large negative or positive numbers over the four month period. This term was therefore eliminated from the CAT forecast program.

THE EIGHTH TERM

The Eighth Term is $2^8 G$ where G is the absolute value of horizontal divergence. It was computed by taking the derivative of omega with respect to pressure. As previously stated the entrance and exit regions of isotach maxima areas have been found to be associated with CAT. These areas are also associated with horizontal convergence at the entrance and divergence at the exit regions. Therefore the absolute value of the change in omega with pressure represents the convergence and divergence in the layer parallel to the pressure surfaces.

This term was computed by subtracting the lower level omega value from the upper level omega value at each grid point. Areas of convergence and divergence of the height field are quite vividly depicted by the divergence field. No significant relationship was found between the divergence field and the CAT occurrences, therefore, it was eliminated from the CAT forecast program.

THE NINTH TERM

The Ninth Term was KAT2, the summation of all previous terms. No significant relationship was found with CAT occurrences since several terms tended to cancel each other out.

The program then goes into the second layer from 300 to 200 millibars. All terms were computed and scaled the same, except the divergence term. It could not be computed because the 200 millibar omega field was not available.

The third layer from 200 to 100 millibars could not be run for these time periods since the 100 millibar fields were not available. There were very few CAT reports above 200 millibars, therefore, the loss was insignificant.

In all three layers the lower level height field is printed out first. This gives a general impression of the synoptic situation and renders more significance to the patterns developed in the other fields. The contour interval for the 500 millibar field is 60 meters with the origin at 5580 meters. The contour interval for the 300 millibar field is 120 meters with the origin at 9120 meters. The contour interval for the 200 millibar field is 120 meters with the origin at 11,760 meters.

The CAT forecast program appears in Appendix D. The first three terms of the research program are used with minor changes. In the first term "a" is changed to minus one and the contour interval has been changed to 150 to give better defined patterns. The second term has been used unchanged. The third term is unchanged except for the contour interval which was changed to 50 to increase the pattern size. The KAT field itself is the summation of these three terms and gives quite reasonable patterns and pattern sizes.

The pattern area depicting a high probability of CAT would necessarily be larger during a more active CAT period. The most active part of the year was the four month period December 1964, January, February, and March 1965. During these months the most active three day period was the tenth through the twelfth of March 1965. Therefore the KAT fields have quite large pattern sizes in Appendix E since they represent the most active three days of the year. The KAT field patterns were smaller for less active periods. The total area covered by these patterns is much less in the KAT field than in the other three parameter fields.

This is exactly what was attempted in order to obtain optimum size of the forecasted danger areas. If the KAT field patterns are too large, flights will be rerouted unnecessarily. On the other hand, if the KAT field patterns are too small, there is a real danger of CAT occurring outside these areas. Therefore, the restraint of the KAT field patterns is necessary in order to have an operationally useable product.

4. DISCUSSION AND RECOMMENDATION FOR FUTURE STUDIES

The period used in this paper was chosen because of the largest number of reported CAT occurrences. Of the four month period (December 1964, January, February and March 1965) there were scattered periods where a large number of occurrences were reported. This four-month period was used to determine which parameters were best suited for forecasting purposes. The three-day period of 10-12 March 1965 was selected for a correlation study in order to find out how successful our forecast method is. Tables 2, 3, and 4 show the various fields used and the resultant KAT field for the 10th, 11th and 12th of March 1965.

The use of the term "percent correlation" as used in this study does not mean to imply a statistical correlation. The ideal forecast verification makes use of those cases where CAT is forecast, but does not occur, and where CAT is not forecast and does not occur. In our study it was impossible to take those cases quantitatively into account. Therefore, it is to be understood that "correlation" as used in this study was a general comparison of those reported CAT occurrences that fell within the delineated area of high probability of CAT against those that did not. For example, if there were ten reported CAT occurrences for a given layer and time period and six of these reports fell inside or on the line delineating the CAT area and four reports fell outside the area, then for that field, layer and time period we would list it as six occurrences correlated or a sixty percent correlation.

Listed are the names of the fields, the number of occurrences of CAT for each field and the percent correlation by field. Also shown are the number of occurrences and the number of occurrences that correlated by field and CAT intensity.

After combining the Laplacian of Vorticity, Vertical Gradient of Thermal Wind and Kinetic Energy we arrive at the KAT Field which is our end product for the area of high probability of CAT occurrences. Even though a higher correlation may be seen in some fields other than the KAT field, one should realize that these fields encompassed a larger than average area. In such cases one must expect a high correlation.

The high correlation is then not due to the finesse of the forecast method, but rather due to the fact that for most of the USA there was a forecast of high probability for CAT. Theoretically, it would be a good idea to divide the percent correlation (such as we computed) by the size of the area for which CAT was forecasted. We did not follow this idea quantitatively, but only qualitatively. Therefore, one finds that the percent correlation for our ultimate forecast (labeled KAT) is sometimes lower than the percent correlation for one of the three separate forecasting fields.

Table 5 is a summary for the three day period. It shows the total number of CAT occurrences by turbulence category, percent correlation by field and turbulence category, and the three day percent correlation by field.

The results were most encouraging and we feel that our end product was a substantial step in at least the right direction toward forecasting clear air turbulence. Our knowledge of the meso- and micro- structure of flow patterns in the free atmosphere, especially above the tropopause, is still rather poor. A strong need still exists for a well organized and well equipped measurement program, especially at flight levels of the future supersonic transport aircraft. Measurement programs using

methods of data collection other than aircraft should be sought in order to obtain more information on the real micro- structure of the atmosphere, without the large disturbances which a flying aircraft will create itself.

Case studies of CAT occurrences so far were limited to a comparison of turbulence location with atmospheric parameters measured as closely as possible to the time of occurrence. We might gain some additional information on the physical causes of CAT if the development and previous history of flow patterns bearing CAT were studied.

There still exists a need for sensitive, accurate and compact instrumentation, especially an accelerometer which measures and records the three components of gustiness separately and simultaneously.

In summarizing we would like to state that turbulence research in the free atmosphere has come a long way, especially when we consider the fact that measurements are most difficult to duplicate in controlled experiments. We need the free atmosphere above us to conduct our research, and this same atmosphere has an infinite choice of parameter combinations. This should provide the seed of interest to combine the efforts of physics, aerodynamics, mathematics, statistics and meteorology to seek out and find a more complete and more satisfying solution of the problem.

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6. APPENDIX A

EQUATIONS

The numbers in parentheses on this and the following pages refer to the page numbers in the text where each item is discussed.

The numbers below each term in the following two equations identify the number of each term (e.g., KAT1 is the sixth term).

THE RESEARCH PROGRAM (p. 15)

$$\text{KAT1} = 2^{\underset{6}{a}}\underset{1}{A} - 2^{\underset{2}{b}}\underset{2}{B} - 2^{\underset{3}{c}}\underset{3}{C} - 2^{\underset{4}{d}}\underset{4}{D} - 2^{\underset{5}{e}}\underset{5}{E}$$

$$\text{KAT2} = \text{KAT1} - 2^{\underset{9}{f}}\underset{6}{F} - 2^{\underset{7}{g}}\underset{8}{G}$$

THE FIRST TERM $2^a A$ (p. 15)

$$a = 0 \quad A = \nabla^2 \eta \quad \eta_0 = f + \frac{g}{fd^2} [Z_1 + Z_2 + Z_3 + Z_4 - 4Z_0]$$

$$\nabla^2 \eta_0 = \frac{1}{d^2} [\eta_1 + \eta_2 + \eta_3 + \eta_4 - 4\eta_0] \quad \nabla^2 \eta = 1/2 [\nabla^2 \eta_u + \nabla^2 \eta_L]$$

THE SECOND TERM $2^b B$ (p. 16)

$$b = 0 \quad B = \left| \frac{\vec{\Delta P}}{\Delta P} \cdot \vec{t} \right|$$

$$U_t = \frac{-g}{fT} \frac{[T_2 - T_4]}{2d}$$

$$V_t = \frac{g}{fT} \frac{[T_3 - T_1]}{2d}$$

$$\vec{V}_{t_u} = U_{t_u} \mathbf{i} + V_{t_u} \mathbf{j}$$

$$\vec{V}_{t_L} = U_{t_L} \mathbf{i} + V_{t_L} \mathbf{j}$$

$$\frac{\Delta \vec{V}_t}{\Delta P} = \frac{\vec{V}_{t_L} - \vec{V}_{t_u}}{\Delta P} = \frac{[U_{t_L} \mathbf{i} + V_{t_L} \mathbf{j}]}{\Delta P} - \frac{[U_{t_u} \mathbf{i} + V_{t_u} \mathbf{j}]}{\Delta P}$$

$$\frac{\Delta \vec{V}_t}{\Delta P} = \frac{[U_{t_L} - U_{t_u}]}{\Delta P} i + \frac{[V_{t_L} - V_{t_u}]}{\Delta P} j = \frac{\Delta U_t}{\Delta P} i + \frac{\Delta V_t}{\Delta P} j$$

$$\left| \frac{\Delta \vec{V}_t}{\Delta P} \right| = \left(\frac{\Delta U_t}{\Delta P} \right)^2 + \left(\frac{\Delta V_t}{\Delta P} \right)^2$$

THE THIRD TERM $2^c C$ (p. 16)

$$c = 0 \quad C = \frac{\bar{\vec{V}}^2}{2}$$

$$U_g = \frac{-g}{f} \frac{[Z_2 - Z_4]}{2d}$$

$$V_g = \frac{g}{f} \frac{[Z_3 - Z_1]}{2d}$$

$$\bar{U}_g = \frac{U_{g_u} + U_{g_L}}{2}$$

$$\bar{V}_g = \frac{V_{g_u} + V_{g_L}}{2}$$

$$\bar{\vec{V}}_g = \bar{U}_g i + \bar{V}_g j$$

$$\bar{\vec{V}}_g^2 = (\bar{U}_g)^2 + (\bar{V}_g)^2$$

THE FOURTH TERM $2^d D$ (p. 17)

$$d = 1 \quad D = \left| \frac{\Delta \bar{\vec{V}}^2}{\Delta P} \right|$$

$$\frac{\Delta \bar{\vec{V}}^2}{\Delta P} = \frac{\bar{\vec{V}}_L^2 - \bar{\vec{V}}_u^2}{\Delta P}$$

$$\left| \frac{\Delta \bar{\vec{V}}^2}{\Delta P} \right| = \sqrt{\left(\frac{\Delta \bar{\vec{V}}^2}{\Delta P} \right)^2}$$

THE FIFTH TERM 2^e (p. 18)

$$e = 1 \quad E = \left| \nabla^2 \frac{\bar{\vec{V}}^2}{2} \right|$$

$$\nabla^2 \bar{\vec{V}}_0^2 = \frac{1}{d^2} [\bar{\vec{V}}_1^2 + \bar{\vec{V}}_2^2 + \bar{\vec{V}}_3^2 + \bar{\vec{V}}_4^2 - 4\bar{\vec{V}}_0^2] \quad \left| \nabla^2 \bar{\vec{V}}_0^2 \right| = \sqrt{(\nabla^2 \bar{\vec{V}}_0^2)^2}$$

THE SIXTH TERM (p. 18)

$$KAT1 = \nabla^2 \eta - \left| \frac{\Delta \vec{V}}{\Delta P} t \right| - \frac{\bar{\vec{V}}^2}{2} - \left| \frac{\Delta \bar{\vec{V}}^2}{\Delta P} \right| - \left| \nabla^2 \frac{\bar{\vec{V}}^2}{2} \right|$$

THE SEVENTH TERM 2^f (p. 18)

$$f = 11 \quad F = J[T, \omega]$$

$$J[T, \nabla_3 \cdot \vec{V}] = \frac{-1}{\gamma P} J[T, \omega]$$

$$J[T, \omega] = \frac{1}{4d^2} [(T_3 - T_1)(\omega_2 - \omega_4) - (T_2 - T_4)(\omega_3 - \omega_1)]$$

THE EIGHTH TERM 2^g (p. 19)

$$g = 13 \quad G = \left| \frac{\Delta \omega}{\Delta P} \right|$$

$$\frac{\Delta \omega}{\Delta P} = \frac{1}{\Delta P} [\omega_L - \omega_u] \quad \left| \frac{\Delta \omega}{\Delta P} \right| = \frac{1}{\Delta P} \sqrt{(\omega_L - \omega_u)^2}$$

THE NINTH TERM (p. 20)

$$\text{KAT2} = \text{KAT1} + 2^{11} J[\text{T}, \omega] - 2^{13} \left| \frac{\Delta \omega}{\Delta P} \right|$$

PROG KAT PROGRAM (p. 20)

$$\text{KAT} = 2^{-1} \nabla^2 \eta - \left| \frac{\Delta \vec{V}_T}{\Delta P} \right| - \frac{\vec{V}^2}{2}$$

7. APPENDIX B

THE RESEARCH COMPUTER PROGRAM

F	CARD	DATA	IDENT	ETHEL MURKIN	DESCRIPTION
	00600	50 0 00000 00600	CRG	6003	CAT FOR LAST REGULATING PROGRAM COMPUTES 500 TO 300 MB LAYER
	00601	20 0 02001 50 0 00000	STA	TIME	PUT DATE TIME IN A REGISTER
	00602	75 4 00720 50 0 00000	RTJ	READD2	READS PACKED LOWER LEVEL D FIELD INTO FS4
	00603	75 4 00726 50 0 00000	PTJ	UNPCKD2	UNPACKS LOWER LEVEL D FIELD INTO FS1
	00604	75 4 00746 50 0 00000	PTJ	READT2	READS LOWER LEVEL TEMPERATURE FIELD INTO FS4
	00605	75 4 00754 50 0 00000	RTJ	UNPCKT2	UNPACKS LOWER LEVEL TEMPERATURE FIELD INTO FS4
	00606	75 4 00705 50 0 00000	RTJ	READD1	READS PACKED UPPER LEVEL D FIELD INTO FS4
	00607	75 4 00713 50 0 00000	PTJ	UNPCKD1	UNPACKS UPPER LEVEL D FIELD INTO FS0
	00610	75 4 00733 50 0 00000	PTJ	READT1	READS UPPER LEVEL TEMPERATURE FIELD IN TO FS4
	00611	75 4 00741 50 0 00000	RTJ	UNPCKT1	UNPACKS UPPER LEVEL TEMPERATURE FIELD INTO FS2
	00612	75 4 00761 50 0 00000	PTJ	REWIND	REWINDS TL 3 CH 5/6
	00613	75 4 00765 50 0 00000	RTJ	REWIND1	PRINTS LOWER HEIGHT FIELD
	00614	75 4 01447 50 0 00000	RTJ	PRINT	GENERATES SINE FIELD STOWS IN FS4
	00615	75 4 00771 50 0 00000	RTJ	SINF	COMPUTES VORTICITY FIELD FROM UPPER LEVEL D FIELD STOWS IN FS5
	00616	75 4 00774 50 0 00000	RTJ	VORTIS1	COMPUTES VORTICITY FIELD FROM LOWER LEVEL D FIELD STOWS IN FS6
	00617	75 4 01061 50 0 00000	RTJ	VORTIS2	COMPUTES LAPLACIAN OF UPPER LEVEL VORT ICITY FIELD STOWS IN FS0
	00618	75 4 01066 50 0 00000	RTJ	LAPLAC1	

MORGAN

00620	75 4 01114 50 0 00000	+	RTJ	LAPLAC2	COMPUTES LAPLACIAN OF LOWER LEVEL VORTICITY FIELD STOMS IN FS1
00621	75 4 01122 50 0 00000	+	RTJ	HORIZ	COMPUTES AVERAGE VORTICITY BETWEEN UPPER AND LOWER LEVELS STOMS IN FS5
00622	75 4 01473 50 0 00000	+	RTJ	PRINT1	STOMS SCALED MAP FACTOR IN FS6
00623	75 4 01127 50 0 00000	+	RTJ	PHAT	COMPUTES U COMPONENT OF THERMAL WIND AT LOWER LEVEL STOMS IN FS0
00624	75 4 01135 50 0 00000	+	RTJ	UTHM1	COMPUTES U COMPONENT OF THERMAL WIND AT LOWER LEVEL STOMS IN FS1
00625	75 4 01153 50 0 00000	+	RTJ	UTHM2	COMPUTES U COMPONENT DIFFERENCE BETWEEN UPPER AND LOWER LEVELS STOMS IN FS0
00626	75 4 01071 50 0 00000	+	RTJ	DUTHM	COMPUTES V COMPONENT OF THERMAL WIND AT LOWER LEVEL STOMS IN FS1
00627	75 4 01076 50 0 00000	+	RTJ	VTHM1	COMPUTES V COMPONENT OF THERMAL WIND AT UPPER LEVEL STOMS IN FS2
00630	75 4 01114 50 0 00000	+	RTJ	VTHM2	COMPUTES V COMPONENT DIFFERENCE BETWEEN UPPER AND LOWER LEVELS STOMS IN FS1
00631	75 4 01132 50 0 00000	+	RTJ	DVTHM	COMPUTES VERTICAL GRADIENT OF THERMAL WIND STOMS IN FS0
00632	75 4 01137 50 0 00000	+	RTJ	DTHM	HORIZ MINUS DTHM STOMS IN FS5
00633	75 4 01517 50 0 00000	+	RTJ	PPRINT2	SEE ABOVE
00634	75 4 01147 50 0 00000	+	RTJ	KAT1	SEE ABOVE
00635	75 4 00720 50 0 00000	+	RTJ	READD2	SEE ABOVE
00636	75 4 00726 50 0 00000	+	RTJ	UNPCKD2	SEE ABOVE
00637	75 4 00705 50 0 00000	+	RTJ	READD1	SEE ABOVE
00640	75 4 00713 50 0 00000	+	RTJ	UNPCKD1	SEE ABOVE
00641	75 4 00761 50 0 00000	+	RTJ	REWIND	REWINDS TU 3 CH 5/6
00642	75 4 00765 50 0 00000	+	RTJ	REWIND1	

00643	75 4 00771 50 0 00000	+	RTJ	SINF	SEE ABOVE
00644	75 4 01277 50 0 00000	+	RTJ	WHAT	SEE ABOVE
00645	75 4 01154 50 0 00000	+	RTJ	UGE0S1	COMPUTES U COMPONENT OF GEOSTROPHIC WIND AT UPPER LEVEL STOWS IN FS2
00646	75 4 01172 50 0 00000	+	RTJ	UGE0S2	COMPUTES U COMPONENT OF GEOSTROPHIC WIND AT LOWER LEVEL STOWS IN FS3
00647	75 4 01210 50 0 00000	+	RTJ	UGE0S	COMPUTES AVERAGE U COMPONENT STOWS IN FS2
00650	75 4 01217 50 0 00000	+	RTJ	VGE0S1	COMPUTES V COMPONENT OF GEOSTROPHIC WIND AT UPPER LEVEL STOWS IN FS3
00651	75 4 01235 50 0 00000	+	RTJ	VGE0S2	COMPUTES V COMPONENT OF GEOSTROPHIC WIND AT LOWER LEVEL STOWS IN FS3
00652	75 4 01253 50 0 00000	+	RTJ	VGE0S	COMPUTES AVERAGE V COMPONENT STOWS IN FS3
00653	75 4 01262 50 0 00000	+	RTJ	KINETIC	COMPUTES V SQUARE STOWS IN FS0 COMPUTES V SQ DIFF STOWS IN FS4
00654	75 4 01567 50 0 00000	+	RTJ	PRINT4	
00655	75 4 01613 50 0 00000	+	RTJ	PRINT5	
00656	75 4 01274 50 0 00000	+	RTJ	LAPKIN	COMPUTES LAPLACIAN OF KINETIC ENERGY STOWS IN FS6
00657	75 4 01637 50 0 00000	+	RTJ	PRINT6	
00660	75 4 01306 50 0 00000	+	RTJ	KAT2	STOWS PREVIOUS TERMS IN FS0
00661	75 4 01663 50 0 00000	+	RTJ	PRINT7	
00662	75 4 03746 50 0 00000	+	RTJ	READT2	SEE ABOVE
00663	75 4 00754 50 0 00000	+	RTJ	UNPCKT2	SEE ABOVE
00664	75 4 00761 50 0 00000	+	RTJ	REWIND	REWINDS TU 3 CH 5/6
00665	75 4 01327 50 0 00000	+	RTJ	READ02	READS OMEGA FIELD INTO FS4
00666	75 4 01335 50 0 00000	+	RTJ	UNPCK02	UNPACKS LOWER LVL OMEGA INTO FS6

MERGE

00667	75 4 00765 50 0 00000	+	RTJ	RWIND1	RELWDS T02 CH 5/6
00670	75 4 01842 50 0 00000	+	RTJ	MIDRE	COMPUTE THE JACOBIAN OF TEMPERATURE AND OMEGA STOWS IN FS1
00671	75 4 01814 50 0 00000	+	RTJ	READ01	READS OMEGA FIELD INTO FS4
00672	75 4 01822 50 0 00000	+	RTJ	UNPCK01	UNPACKS UPPER LVL OMEGA INTO FS5
00673	75 4 00765 50 0 00000	+	RTJ	RWIND1	
00674	75 4 01355 50 0 00000	+	RTJ	HURDVG	COMPUTES HORIZONTAL DIVERGENCE STOWS FS5
00675	75 4 01365 50 0 00000	+	RTJ	ABSDIV	COMPUTES ABSOLUTE DIVERG STOWS IN FS5
00676	75 4 01707 50 0 00000	+	RTJ	PRINTF	
00677	75 4 01543 50 0 00000	+	RTJ	PRINTF	
00700	75 4 01373	+	RTJ	KAT	COMPUTES VORTICITY DIFFERENCE PLUS THERMAL WIND DIFFERENCE PLUS KINETIC ENERGY DIFFERENCE PLUS THE CHANGE IN KINETIC ENERGY PLUS KINETIC ENERGY PLUS THE DIVERGENCE
00701	50 0 00000 75 4 01663 50 0 00000	+	RTJ	PRINT7	
00702	75 4 01400 50 0 00000	+	RTJ	LAYER2	COMPUTES 300 TO 200 MB LAYER
00703	75 4 01424 50 0 00000	+	RTJ	LAYER3	COMPUTES 200 TO 100 MB LAYER
00704	76 0 00000 50 0 00000	+	SLS		END OF STEERING PROGRAM USES OFF LINE PRINTING
00705	75 0 00000 50 0 00000	READD1	SLJ	**	
00706	10 0 02001 10 0 01735	+	LOA ECC	TIME TABLE1	
00707	75 4 04231 50 0 00000	+	RTJ 00	MAG 0,0	
00710	50 0 02014 50 0 01300	PIGFD	ENI INI	MAA 1303B	
00711	50 0 44215 50 0 52007		ENI ENI	FS4 READERR	
00712	75 0 00705 50 0 00000		SLJ	READD1	
00713	75 0 00000 50 0 00000	UNPCK 1	SLJ INI	** 0,6	

MARKA

00714	75 0 00714 50 0 44215	+	SLJ 00	*+2 FS4
00715	75 0 05015 50 0 02453		00 00	FS4 24538
00716	75 0 04715 50 0 00007	+	RTJ 00	WAB 7
00717	75 0 00713 50 0 00000		SLJ	UVCKD1
00720	75 0 00000 50 0 00000	READD	SLJ	**
00721	12 0 02001 18 0 01743	+	LDA 00	TIME NAME2
00722	75 0 04231 50 0 00000	+	RTJ 00	MAG 0,0
00723	50 0 02014 50 0 01300		FIN 00	MAA 13008
00724	50 0 44215 50 0 02007		FIN 00	FS4 READER
00725	75 0 00720 50 0 00000		SLJ	READD2
00726	75 0 00000 50 0 00000	UVCKD2	SLJ 00	** 0,6
00727	75 0 00731 50 0 44215	+	SLJ 00	*+2 FS4
00730	50 0 14055 50 0 02453		00 00	FS1 24538
00731	75 0 04715 50 0 00007	+	RTJ 00	WAB 7
00732	75 0 00726 50 0 00000		SLJ	UVCKD2
00733	75 0 00000 50 0 00000	READD1	SLJ	**
00734	12 0 02001 18 0 01743	+	LDA 00	TIME NAME3
00735	75 0 04231 50 0 00000	+	RTJ 00	MAG 0,0
00736	50 0 02014 50 0 01300	HIGHT	FIN 00	MAA 13008
00737	50 0 44215 50 0 02007		FIN 00	FS4 READER
00740	75 0 00733 50 0 00000		SLJ	READD1
00741	75 0 00000 50 0 00000	UVCKD1	SLJ 00	** 0,6
00742	75 0 00744 50 0 44215	+	SLJ 00	*+2 FS4
00743	50 0 24215 50 0 02453		00 00	FS2 24538

SPPA

00744	75 0 04715 50 0 00000	+	RTJ ENI	WAB 7
00745	75 0 00741 50 0 00000		SLJ	UNPKCT1
00746	75 0 00000 50 0 00000	READT2	SLJ	**
00747	12 0 02001 16 0 01746	+	IPA LDG	TIME NAME4
00750	75 0 04231 50 0 00000	+	RTJ ENI	MAG 0,0
00751	50 0 02014 50 0 01300		ENI ENI	MAA 13008
00752	50 0 04215 50 0 02007		ENI ENI	FS4 READERR
00753	75 0 00746 50 0 00000		SLJ	READT2
00754	75 0 00000 50 0 00000	UNPKCT2	SLJ ENI	** 0,6
00755	75 0 00747 50 0 04215	+	SLJ ENI	**2 FS4
00756	50 0 04235 50 0 02453		ENI ENI	FS3 24538
00757	75 0 04715 50 0 00007	+	RTJ ENI	WAB 7
00760	75 0 00754 50 0 00000		SLJ	UNPKCT2
00761	75 0 00000 50 0 00000	REWIND	SLJ	**
00762	75 0 02014 50 0 11406	+	RTJ ENI	MAA 113068
00763	75 0 00761 50 0 00000	+	SLJ	REWIND
00764	75 0 02013 50 0 00000	+	SLJ	WINDERR
00765	75 0 00000 50 0 00000	REWIND	SLJ	**
00766	75 0 02014 50 0 11206	+	RTJ ENI	MAA 112068
00767	75 0 00765 50 0 00000	+	SLJ	REWIND1
00770	75 0 02013 50 0 00000	+	SLJ	WINDERR
00771	75 0 00000 50 0 00000	SINF	SLJ	**
00772	75 0 04235 50 0 04215	+	RTJ ENI	SAI FS4
00773	75 0 00771 50 0 00000	+	SLJ	SINF

MERCAS

C1024	20 4 54 55 50 0 00 00		STA	FS5,4
C1025	54 4 07 50 75 0 01 23	+	ISK SLJ	7600B,4 LOCPI
C1026	75 0 01 22 50 0 00 00		SLJ	HORIZ
C1027	75 0 00 00 50 0 00 00	MHAT	SLJ	**
C1030	75 4 34 56 00 0 02 02	+	RTJ 00	SAJ HATERP
C1031	50 0 44 15 50 0 03 15		FNI FNI	FS4 FS6
C1032	75 4 34 51 00 0 04 57	+	RTJ 00	SAJ SAJ+7R
C1033	50 0 04 57 50 0 04 57		FNI FNI	SAJ+7R SAJ+7R
C1034	75 0 01 27 50 0 00 00		SLJ	MHAT
C1035	75 0 00 00 50 0 00 00	UTHM1	SLJ	**
C1036	75 4 04 45 00 0 01 04	DIF1	RTJ 00	SAJ OUTSIDE1
C1037	50 0 01 43 50 0 01 43	+	FNI FNI	INSIDI INSIDI
C1040	75 0 01 35 50 0 00 00	+	SLJ	UTHM1
C1041	10 0 00 00 20 2 05 15	CUTSTOI	FNA STA	0 FS0,2
C1042	75 0 01 36 50 0 00 00		SLJ	DIF1
C1043	12 2 44 21 01 0 00 01	INSIDI	LDA ARS	FS4,2 1
C1044	14 0 01 33 20 0 01 75		ADD STA	CONST1 LOCAT1
C1045	20 0 01 75 20 0 01 75		MUF STA	LOCAT1 LOCAT1
C1046	12 3 24 51 15 1 24 51		LDA SUB	FS2,3 FS2,1
C1047	20 0 01 76 12 0 01 34		STA LUA	LOCAT2 CONST2
C1050	20 0 03 15 20 0 01 76		MUF MUF	FS6,2 LOCAT2
C1051	27 0 01 75 27 0 24 51		DVF DVF	LOCAT1 FS2,2
C1052	20 0 05 15 75 0 01 36		STA SLJ	FS0,2 DIF1
C1053	75 0 00 00 50 0 00 00	UTHM2	SLJ	**

MURGAJ

01054	75 4 04451 50 0 01157		RTJ 10	SAH OUTSID2
01055	50 0 01161 50 0 01161	+	FNI FNI	INSID2 INSID2
01056	75 0 01053 50 0 00000	+	SLJ	UTHM2
01057	10 0 00000 20 2 14655	OUTSID2	FNA STA	0 FS1,2
01060	75 0 01054 50 0 00000		SLJ	DIF2
01061	12 2 44215 01 0 00001	INSID2	LDA ARS	FS4,2 1
01062	14 0 01733 20 0 01775		ADD STA	CONST1 LOCAT1
01063	26 0 01775 20 0 01775		MUF STA	LOCAT1 LOCAT1
01064	12 3 34355 15 1 34355		LDA SUB	FS3,3 FS3,1
01065	20 0 01776 12 0 01734		STA LDA	LOCAT2 CONST2
01066	26 2 63715 26 0 01776		MUF MUF	FS6,2 LOCAT2
01067	27 0 01775 27 2 34355		DVF DVF	LOCAT1 FS3,2
01070	20 2 14655 75 0 01054		STA SLJ	FS1,2 DIF2
01071	75 0 00000 50 4 00000	DUTHM	SLJ FNI	** 0,4
01072	12 4 05015 15 4 14655	LOOP4	LDA SUB	FS0,4 FS1,4
01073	20 4 05015 50 0 00000		STA	FS0,4
01074	54 4 07600 75 0 01072	+	ISK SLJ	7600B,4 LOOP4
01075	75 0 01071 50 0 00000		SLJ	DUTHM
01076	75 0 00000 50 0 00000	VTHM1	SLJ	**
01077	75 4 04451 00 0 01102	DIF3	RTJ 00	SAH OUTSID3
01100	50 0 01104 50 0 01104	+	FNI FNI	INSID3 INSID3
01101	75 0 01076 50 0 00000	+	SLJ	VTHM1
01102	10 0 00000 20 2 14655	OUTSID3	FNA STA	0 FS1,2
01103	75 0 01077 50 0 00000		SLJ	DIF3

FORGAT

C1104	12 2 44215 01 0 00001	INSID4	LDA ARS	FS4,2 1
C1105	14 0 01734 20 0 01775		ADD STA	CONST1 LOCAT1
C1106	26 0 01775 20 0 01775		MUF STA	LOCAT1 LOCAT1
C1107	12 5 24516 15 5 24514		LDA SUB	FS2+1,2 FS2-1,2
C1110	20 0 01776 12 0 01734		STA LDA	LOCAT2 CONST2
C1111	26 4 63715 26 0 01776		MUF MUF	FS6,2 LOCAT2
C1112	27 0 01775 27 2 24515		DVF DVF	LOCAT1 FS2,2
C1113	20 3 14655 75 0 01677		STA SLJ	FS1,2 DIF3
C1114	75 0 00000 50 0 00000	VTHM2	SLJ	**
C1115	75 4 04451 00 0 01120	DIF4	RTJ LO	S4H OUTSID4
C1116	50 0 01122 50 0 01122	+	ENI ENI	INSID4 PISID4
C1117	75 0 01114 50 0 00000	+	SLJ	VTHM2
C1120	10 2 00000 20 2 24515	OUTSID4	ENA STA	0 FS2,2
C1121	75 0 01115 50 0 00000		SLJ	DIF4
C1122	12 2 44215 01 0 00001	INSID4	LDA ARS	FS4,2 1
C1123	14 0 01732 20 0 01775		ADD STA	CONST1 LOCAT1
C1124	26 0 01775 20 0 01775		MUF STA	LOCAT1 LOCAT1
C1125	12 2 34356 15 2 34354		LDA SUB	FS3+1,2 FS3-1,2
C1126	20 0 01776 12 0 01734		STA LDA	LOCAT2 CONST2
C1127	26 2 63715 26 0 01776		MUF MUF	FS6,2 LOCAT2
C1130	27 0 01775 27 2 34356		DVF DVF	LOCAT1 FS3,2
C1131	20 0 01115 75 0 01115		STA SLJ	FS2,2 DIF4
C1132	75 0 00000 50 4 00000	CVTHM	SLJ ENI	** 0,4
C1133	12 4 24515 15 4 14655	LOOP7	LDA SUB	FS2,4 FS1,4

MURCATI

C1134	20 4 14655 50 0 00000		STA	FS1,4
C1135	54 4 07600 75 0 01133	+	ISK SLJ	76008,4 LOOP7
C1136	75 0 01132 50 0 00000		SLJ	DVTHM
C1137	75 0 00900 50 4 00000	DTHM	SLJ FNI	** 0,4
C1140	12 4 05015 20 4 05015	LOOP8	LDA MUF	FS0,4 FS0,4
C1141	20 4 05015 12 4 14655		STA LDA	FS0,4 FS1,4
C1142	26 4 14655 14 4 05015		MUF ADD	FS1,4 FS0,4
C1143	75 4 04666 00 0 02111	+	RTJ SQERR	VAB SQERR
C1144	20 4 05015 50 0 00000	+	STA	FS0,4
C1145	54 4 07600 75 0 01140	+	ISK SLJ	76008,4 LOOP8
C1146	75 0 01137 50 0 00000		SLJ	DTHM
C1147	75 0 00000 50 4 00000	KAT1	SLJ FNI	** 0,4
C1150	12 4 54055 15 4 05015	LOOP9	LDA SUB	FS5,4 FS0,4
C1151	20 4 54055 50 0 00000		STA	FS5,4
C1152	54 4 07600 75 0 01150	+	ISK SLJ	76008,4 LOOP9
C1153	75 0 01147 50 0 00000		SLJ	KAT1
C1154	75 0 00000 50 0 00000	UGEOS1	SLJ	**
C1155	75 4 04451 00 0 01160	DIF5	RTJ SQ	SAH OUTSID5
C1156	50 0 01162 50 0 01162	+	FNI FNI	INSID5 INSID5
C1157	75 0 01154 50 0 00000	+	SLJ	UGEOS1
C1160	10 0 00000 20 2 24515	OUTSID5	FNA STA	0 FS2,2
C1161	75 0 01155 50 0 00000		SLJ	DIF5
C1162	12 2 44215 01 0 00001	INSID5	LDA ARS	FS4,2 1
C1163	14 0 01733 20 0 01775		ADD STA	CUNST1 LOCAT1

MURCAT	26 0 01775 20 0 01775	MUF STA	LOCAT1 LOCAT1
C1164	26 0 01775 20 0 01775	MUF STA	LOCAT1 LOCAT1
C1165	12 3 05015 15 1 05015	LDA SUB	FS0,3 FS0,1
C1166	20 0 01776 12 0 01734	STA LDA	LOCAT2 CONST2
C1167	26 2 63715 26 0 01776	MUF MUF	FS6,2 LOCAT2
C1170	27 0 01775 20 2 24515	DVF STA	LOCAT1 FS2,2
C1171	75 0 01155 50 0 00500	SLJ	DIF5
C1172	75 0 00000 50 0 00000	SLJ	**
C1173	75 4 04451 00 0 01176	RTJ DO	SAH OUTSID6
C1174	50 0 01200 50 0 01200	FNI FNI	INSID6 INSID6
C1175	75 0 01172 50 0 00000	SLJ	UGEOS?
C1176	10 0 00000 20 2 34355	ENA STA	0 FS3,2
C1177	75 0 01173 50 0 00000	SLJ	DIF6
C1200	12 2 44215 01 0 00501	LDA ARS	FS4,2 1
C1201	14 0 01733 20 0 01775	ADD STA	CONST1 LOCAT1
C1202	26 0 01775 20 0 01775	MUF STA	LOCAT1 LOCAT1
C1203	12 3 14655 15 1 14655	LDA SUB	FS1,3 FS1,1
C1204	20 0 01776 12 0 01734	STA LDA	LOCAT2 CONST2
C1205	26 2 63715 26 0 01776	MUF MUF	FS6,2 LOCAT2
C1206	27 0 01775 20 2 34355	DVF STA	LOCAT1 FS3,2
C1207	75 0 01173 50 0 00000	SLJ	DIF6
C1210	75 0 00000 50 4 00000	SLJ FNI	** 0,4
C1211	12 4 24515 05 0 00003	LDA ALS	FS2,4 3
C1212	20 0 01775 12 4 34355	STA LDA	LOCAT1 FS3,4
C1213	05 0 00003 14 0 01775	ALS ADD	3 LOCAT1

MURGAN

01214	20 4 24515 50 0 00000		STA	FS2,4
01215	54 4 07600 75 0 01211	+	ISK SLJ	76008,4 LOOP10
01216	75 0 01210 50 0 00000		SLJ	UGF05
01217	75 0 00000 50 0 00000	VGEO51	SLJ	**
01220	75 4 04451 00 0 01223	DIF7	RTJ CO	SAH OUTSID7
01221	50 0 01225 50 0 01225	+	ENI ENI	INSID7 INSID7
01222	75 0 01217 50 0 00000	+	SLJ	VGEO51
01223	10 0 00000 20 2 34355	OUTSID7	ENA STA	0 FS3,2
01224	75 0 01220 50 0 00000		SLJ	DIF7
01225	12 2 44215 01 0 00001	INSID7	LDA ARS	FS4,2 1
01226	14 0 01733 20 0 01775		ADD STA	CONST1 LOCAT1
01227	26 0 01775 20 0 01775		MUF STA	LOCAT1 LOCAT1
01230	12 2 05016 15 2 05014		LDA SUR	FS0+1,2 FS0-1,2
01231	20 0 01776 12 0 01734		STA LDA	LOCAT2 CONST2
01232	26 2 63715 26 0 01776		MUF MUF	FS6,2 LOCAT2
01233	27 0 01775 20 2 34355		DVF STA	LOCAT1 FS3,2
01234	75 0 01220 50 0 00000		SLJ	DIF7
01235	75 0 00000 50 0 00000	VGEO52	SLJ	**
01236	75 4 04451 00 0 01241	DIF8	RTJ CO	SAH OUTSID8
01237	50 0 01243 50 0 01243	+	ENI ENI	INSID8 INSID8
01240	75 0 01235 50 0 00000	+	SLJ	VGEO52
01241	10 0 00000 20 2 05015	OUTSID8	ENA STA	0 FS0,2
01242	75 0 01236 50 0 00000		SLJ	DIF8
01243	12 2 44215 01 0 00001	INSID8	LDA ARS	FS4,2 1

MLKGAH

01244	14 0 01733	ADD	CONST1
	20 0 01775	STA	LOCAT1
01245	26 0 01775	MUF	LOCAT1
	20 0 01775	STA	LOCAT1
01246	12 2 14556	LDA	FS1+1,2
	15 2 14554	SUB	FS1-1,2
01247	20 0 01776	STA	LOCAT2
	12 0 01734	LDA	CONST2
01250	26 2 63715	MUF	FS6,2
	26 0 01776	MUF	LOCAT2
01251	27 0 01775	DVF	LOCAT1
	20 2 05015	STA	FS0,2
01252	75 0 01236	SLJ	DIFR
	50 0 00000		
01253	75 0 00000	SLJ	**
	50 4 00000	ENI	0,4
01254	12 4 34355	LDA	FS3,4
	05 0 00003	ALS	3
01255	20 0 01775	STA	LOCAT1
	12 4 05015	LDA	FS0,4
01256	05 0 00003	ALS	3
	14 0 01775	ADD	LOCAT1
01257	20 4 05015	STA	FS0,4
	50 0 00000		
01260	54 4 07600	ISK	76008,4
	75 0 01254	SLJ	LOOP11
01261	75 0 01253	SLJ	VGEOS
	50 0 00000		
01262	75 0 00000	SLJ	**
	50 2 00000	ENI	0,4
01263	12 4 24515	LDA	FS2,4
	26 4 24515	MUF	FS2,4
01264	20 0 01775	STA	LOCAT1
	12 4 05015	LDA	FS0,4
01265	26 4 05015	MUF	FS0,4
	20 0 01776	STA	LOCAT2
01266	14 0 01775	ADD	LOCAT1
	01 0 00001	AKS	1
01267	20 4 05015	STA	FS0,4
	12 6 01775	LDA	LOCAT1
01270	15 0 01776	SUB	LOCAT2
	20 4 44215	STA	FS4,4
01271	26 4 44215	MUF	FS4,4
	20 4 44215	STA	FS4,4
01272	54 4 07600	ISK	76008,4
	75 0 01263	SLJ	LOOP12
01273	75 0 01262	SLJ	KINETIC
	50 0 00000		

MURGAJ

01274	75 0 00000 50 0 00000		LAPRI4	SLJ	**
01275	75 4 04423 00 0 63715	+		RTJ 00	SAD FS6
01276	00 0 05015 00 0 02006			00 00	FSU LAPERR3
01277	75 4 04451 50 0 04447	+		RTJ FNI	SAH SAD+248
01300	50 0 04435 50 0 04435			FNI FNI	SAD+128 SAD+128
01301	50 4 00000 50 0 00000			FNI	0,4
01302	12 4 63715 26 4 63715	ABS		LDA MUF	FS6,4 FS6,4
01303	20 4 63715 50 0 00000			STA	FS6,4
01304	54 4 07600 75 0 01302	+		ISK SLJ	76008,4 ARS
01305	75 0 01274 50 0 00000			SLJ	LAPKIN
01306	75 0 00000 50 4 00000	KAT2		SLJ FNI	** 0,4
01307	12 4 54055 15 4 05015	LOOP13		LDA SUB	FS5,4 FS0,4
01310	15 4 63715 15 4 44215			SUB SUB	FS6,4 FS4,4
01311	20 4 05015 50 0 00000			STA	FS0,4
01312	54 4 07600 75 0 01307	+		ISK SLJ	76008,4 LOOP13
01313	75 0 01306 50 0 00000			SLJ	KAT2
01314	75 0 00000 50 0 00000	READ01		SLJ	**
01315	12 0 02001 16 0 01751	+		LDA LDD	TIME NAMES
01316	75 4 04231 00 0 00000	+		RTJ 00	MAG 0,0
01317	50 0 02014 50 0 01200			FNI FNI	MAA 12008
01320	50 0 44215 50 0 02007			FNI FNI	FS4 READERR
01321	75 0 01314 50 0 00000			SLJ	READ01
01322	75 0 00000 50 0 00000	UNPCK01		SLJ FNI	** 0,6
01323	75 0 01325 00 0 44215	+		SLJ 00	**2 FS4

01324	00 0 54255 00 0 02453		00 00	FS5 2453B
01325	75 4 04715 50 0 00007	+	RTJ FNI	WAB 7
01326	75 0 01322 50 0 00000		SLJ	UNPCK01
01327	75 0 00000 50 0 00000	READ02	SLJ	**
01330	12 0 02001 16 0 01754	+	LDA LDQ	TIME NAME6
01331	75 4 04231 00 0 00000	+	RTJ 00	MAG 0,0
01332	50 0 02014 50 0 01200		FNI FNI	MAA 1200B
01333	50 0 44215 50 0 02007		FNI FNI	FS4 READERR
01334	75 0 01327 50 0 00000		SLJ	READ02
01335	75 0 00000 50 0 00000	UNPCK02	SLJ FNI	** 0,6
01336	75 0 01340 00 0 44215	+	SLJ 00	**2 FS4
01337	00 0 63715 00 0 02453		00 00	FS6 2453B
01340	75 4 04715 50 0 00007	+	PTJ FNI	WAB 7
01341	75 0 01335 50 0 00000		SLJ	UNPCK02
01342	75 0 00000 50 0 00000	MOORE	SLJ	**
01343	75 4 04371 00 0 14655	+	RTJ 00	SAB FS1
01344	00 0 34355 00 0 63715		00 00	FS4 FS6
01345	00 0 00000 00 0 02003	+	00 00	JACERR
01346	75 4 04451 50 0 04420	+	RTJ FNI	SAH SAB+27B
01347	50 0 04406 50 0 04406	+	FNI FNI	SAB+15B SAB+15B
01350	50 4 00000 50 0 00000		FNI	0,4
01351	12 4 14655 05 0 00013	SHIFT	LDA ALS	FS1,4 11
01352	20 4 14655 50 0 00000		SIA	FS1,4
01353	54 4 07600 75 0 01351	+	ISK SLJ	7600B,4 SHIFT

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01354	75 0 01342 50 0 00000		SLJ	MOORE
01355	75 0 00000 50 4 00000	HURDVG	SLJ FNI	** 0,4
01356	12 4 54055 01 0 00001	LOOP14	LDA ARS	FS5,4 1
01357	20 0 01775 12 4 63715		STA LDA	LOCAT1 FS6,4
01360	01 0 00001 20 0 01776		ARS STA	LOCAT2 1
01361	12 0 01775 15 0 01776		LDA SUB	LOCAT1 LOCAT2
01362	20 4 54055 50 0 00000		STA	FS5,4
01363	54 4 07600 75 0 01356	+	ISK SLJ	7600B,4 LOOP15
01364	75 0 01355 50 0 00000		SLJ	HURDVG
01365	75 0 00000 50 4 00000	ABSDIV	SLJ FNI	** 0,4
01366	12 4 54055 26 4 54055	LOOP17	LDA MUF	FS5,4 FS5,4
01367	05 0 00016 50 0 00000		ALS	14
01370	20 4 54055 50 0 00000	+	STA	FS5,4
01371	54 4 07600 75 0 01366	+	ISK SLJ	7600B,4 LOOP17
01372	75 0 01365 50 0 00000		SLJ	ABSDIV
01373	75 0 00000 50 4 00000	KAT	SLJ FNI	** 0,4
01374	12 4 05015 15 4 54055	LOOP16	LDA SUB	FS0,4 FS5,4
01375	15 4 14655 20 4 05015		SUB STA	FS1,4 FS0,4
01376	54 4 07600 75 0 01374	+	ISK SLJ	7600B,4 LOOP16
01377	75 0 01373 50 0 00000		SLJ	KAT
01400	75 0 00000 12 0 01757	LAYER2	SLJ LDA	** COUNT
01401	05 0 00001 20 0 01757		ALS STA	COUNT 1
01402	22 3 01400 12 0 01736		AJPM LDA	LAYER2 NAME1A
01403	20 0 01735 12 0 01741		STA LDA	NAME1 NAME2A

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01404	20 0 01740 12 0 01744	STA LDA	NAME2 NAME3A
01405	20 0 01743 12 0 01747	STA LDA	NAME3 NAME4A
01406	20 0 01746 12 0 01755	STA LDA	NAME4 NAME6A
01407	20 0 01754 12 0 01761	STA LDA	NAME6 LEVEL2
01410	20 0 01471 20 0 01515	STA STA	TITLE+3 TITLE1+3
01411	20 0 01541 20 0 01565	STA STA	TITLE2+3 TITLE3+3
01412	20 0 01611 20 0 01635	STA STA	TITLE4+3 TITLE5+3
01413	20 0 01661 20 0 01705	STA STA	TITLE6+3 TITLE7+3
01414	20 0 01731 12 0 01763	STA LDA	TITLE8+3 A2
01415	20 0 01461 12 0 01765	STA LDA	A1 B2
01416	20 0 01462 12 0 01767	STA LDA	B1 C2
01417	20 0 01464 12 0 01771	STA LDA	C1 D2
01420	20 0 01463 12 0 01773	STA LDA	D1 E2
01421	61 0 01460 12 0 01777	SAL LDA	E1 TAPUNIT
01422	61 0 00710 61 0 00736	SAL SAL	HIGH HIGH
01423	75 0 00601 50 0 00000	SLJ	START
01424	75 0 00900 12 0 01760	SLJ LDA	** COUNT1
01425	05 0 00001 20 0 01760	ALS STA	I COUNT1
01426	22 0 01424 12 0 01737	AJPM LDA	LAYER3 NAME16
01427	20 0 01735 12 0 01742	STA LDA	NAME1 NAME2B
01430	20 0 01740 12 0 01745	STA LDA	NAME2 NAME3B
01431	20 0 01743 12 0 01750	STA LDA	NAME3 NAME4B
01432	20 0 01746 12 0 01753	STA LDA	NAME4 NAME5B
01433	20 0 01751 12 0 01756	STA LDA	NAME5 NAME6B

01434	20 0 01754 12 0 01762	STA LDA	NAME6 LFVEL3
01435	20 0 01471 20 0 01515	STA	TITLE+3 TITLE1+3
01436	20 0 01541 20 0 01565	STA STA	TITLE2+3 TITLE3+3
01437	20 0 01611 20 0 01635	STA	TITLE4+3 TITLE5+3
01440	20 0 01661 20 0 01705	STA STA	TITLE6+3 TITLE7+3
01441	20 0 01731 12 0 01764	STA LDA	TITLE8+3 A3
01442	20 0 01461 12 0 01766	STA LDA	A1 B3
01443	20 0 01462 12 0 01770	STA LDA	B1 C3
01444	20 0 01464 12 0 01772	STA LDA	C1 D3
01445	20 0 01463 12 0 01774	STA LDA	D1 E3
01446	61 0 01460 75 0 00601	SAL SLJ	E1 START
01447	75 0 00000 10 0 00012	SLJ FNA	** 10
01450	20 0 00017 50 0 00000	STA	17B
01451	75 0 01455 00 0 00000	SLJ 00	**4 0
01452	00 0 14655 00 0 63715	00 00	F51 F56
01453	00 0 00047 00 0 00035	00 00	39 29
01454	00 0 00022 00 0 00010	00 00	18 8
01455	75 4 04745 00 0 00000	RTJ 00	WAE 0
01456	75 4 02524 00 0 63715	RTJ 00	MAC FS6+0
01457	75 0 01447 77 7 63715	SLJ 77	PRINT FS6+7
01460	10 0 02002 00 0 00004	10 00	IAU 4
01461	13 1 11710 47 6 40243	0CT	1311171047640243
01462	02 4 76132 61 0 70664	0CT	0247613261070664
01463	00 1 42600 00 0 00000	0CT	0014260000000000

C1464	01 3 5600 00 0 0000	CCT	0135600000000000		
C1465	00 0 00026 00 0 00026	00 00	22 22		
C1466	20 4 34626 05 5 12943	BCD	4, LOWER LEVEL Z FIELD	LAYER 1	
C1467	65 2 56543 20 3 12066	BCD	4, LOWER LEVEL Z FIELD	LAYER 1	
C1470	71 6 54364 20 3 02020	BCD	4, LOWER LEVEL Z FIELD	LAYER 1	
C1471	43 6 13065 51 2 00120	BCD	4, LOWER LEVEL Z FIELD	LAYER 1	
C1472	75 0 01447 55 0 00900	SLJ	PRINT		
C1473	75 0 00000 10 0 00012	SLJ CNA	** 10		
C1474	20 0 00017 00 0 00000	STA	170		
C1475	75 0 01501 00 0 00500	SLJ 00	**+4 0		
C1476	00 0 54255 20 0 63715	00 00	FS5 FS6		
C1477	00 0 00047 00 0 00035	00 00	39 29		
C1500	00 0 00022 00 0 00010	00 00	13 8		
C1501	75 4 04745 00 0 00000	RTJ 00	WAE 0		
C1502	75 4 02524 00 0 63715	RTJ 00	MAC FS6,0		
C1503	75 0 01473 77 7 63715	SLJ 77	PRINT1 FS6,7		
C1504	10 0 02000 00 0 00001	10 00	TAU 1		
C1505	00 0 00000 00 0 00000	CCT 0			
C1506	20 0 00000 00 0 00000	DEC 0	50-1847		
C1507	00 0 00000 00 0 00000	CCT 0			
C1510	03 1 46314 42 1 46314	DEC 0	10-1847		
C1511	00 0 00000 00 0 00000	00 00	25 25		
C1512	20 4 36147 43 5 16371	DEC	4, LAPLACIAN OF VORTICITY LAYER 1		
C1513	41 4 52046 66 0 02546	DEC	4, LAPLACIAN OF VORTICITY LAYER 1		

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01514	51 2 37163 71 2 33020	TITLE1	BCD	4, LAPLACIAN OF VORTICITY LAYER 1
01515	43 6 13065 51 2 00120	TITLE1	BCD	4, LAPLACIAN OF VORTICITY LAYER 1
01516	75 0 01473 50 0 00000	SLJ	PRINT1	
01517	75 0 00000 10 0 00012	PRINT2	SLJ ENA	** 10
01520	20 0 00017 50 0 00000		STA	178
01521	75 0 01525 00 0 00000	+	SLJ 00	**+ 0
01522	00 0 05015 00 0 63715		00 00	FS0 FS6
01522	00 0 05015		00	FS0
01523	00 0 00047 00 0 00035		00 00	39 29
01524	00 0 00022 00 0 00010		00 00	18 8
01525	75 4 04745 00 0 00000	SKIP	RTJ 00	WAE 0
01526	75 4 05274 00 0 63715	+	RTJ 00	MAC FS6,0
01527	75 0 01517 77 7 63715		SLJ 77	PRINT2 FS6,7
01530	10 0 02000 00 0 00001		10 00	TAU 1
01531	00 0 00000 00 0 00000		001 0	0
01532	20 0 00000 00 0 00000		DEC	50-1847
01533	00 0 00000 00 0 00000		001 0	0
01534	00 6 31463 14 6 31463		DEC	250-3847
01535	00 0 00026 00 0 00026		00 00	22 22
01536	20 2 56551 23 2 06751	TITLE2	BCD	4, VERT GRAD OF VT LAYER 1
01537	61 6 42046 66 2 02523	TITLE2	BCD	4, VERT GRAD OF VT LAYER 1
01540	20 2 02020 20 2 02020	TITLE2	BCD	4, VERT GRAD OF VT LAYER 1
01541	43 6 13065 51 2 00120	TITLE2	BCD	4, VERT GRAD OF VT LAYER 1
01542	75 0 01517 50 0 00000		SLJ	PRINT2
01543	75 0 00000 10 0 00012	PRINT3	SLJ ENA	** 10

PERIOD

01544	00 0 00017		STA	170	
01545	75 0 01551	+	SLJ	**4	
01546	00 0 00000				
01547	00 0 04055			FSS	
01548	00 0 03715			FSS	
01549	00 0 00047		00	39	
01550	00 0 00035		00	29	
01551	00 0 00022		00	18	
01552	00 0 00015		00	0	
01553	75 4 04765	+	RTJ	WAL	
01554	00 0 00009		00	0	
01555	75 4 02324	+	RTJ	MAC	
01556	00 0 03715		00	FSS,0	
01557	75 0 01543		SLJ	PRINT3	
01558	77 7 63715		77	FSS,7	
01559	00 0 02000		00	TAU	
01560	00 0 00000		00	0	
01561	00 0 00000		00	0	
01562	00 0 00000		DEC	50-1847	
01563	00 0 00000		00	0	
01564	03 1 46314		DEC	10-1847	
01565	00 0 00026		00	22	
01566	00 0 00026		00	22	
01567	20 0 12565	TITLE3	PCD	4, AVERAGE DIVERGENCE	LAYER 1
01568	51 6 16765	TITLE3	PCD	4, AVERAGE DIVERGENCE	LAYER 1
01569	20 0 47125	TITLE3	PCD	4, AVERAGE DIVERGENCE	LAYER 1
01570	65 5 16765	TITLE3	PCD	4, AVERAGE DIVERGENCE	LAYER 1
01571	45 6 36520				
01572	20 0 02020				
01573	43 6 12065				
01574	51 3 06120				
01575	75 0 01543		SLJ	PRINT3	
01576	50 0 00000				
01577	75 0 00000	PRINT4	SLJ	**	
01578	10 0 00012		FNA	10	
01579	20 0 00017		STA	170	
01580	50 0 00000				
01581	75 0 01575	+	SLJ	**4	
01582	00 0 00000		00	0	
01583	00 0 00000		00	FSS	
01584	00 0 00000		00	39	
01585	00 0 00000		00	29	

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01574	00 0 00022 00 0 00010			10 00	10 8
01575	75 4 04745 00 0 00000	+		RTJ 00	WAE 0
01576	75 4 02524 00 0 63715	+		RTJ 00	MAC FS6,0
01577	75 0 01567 77 7 63715			SLJ 77	PRINT4 FS6,7
01600	10 0 02000 00 0 00001			10 00	TAU 1
01601	00 0 00000 00 0 00000			0CT 0	0
01602	20 0 00000 00 0 00000			DEC	50-1847
01603	00 0 00000 00 0 00000			0CT 0	0
01604	03 1 46314 63 1 46314			DEC	10-1847
01605	00 0 00026 00 0 00026			00 00	22 22
01606	20 4 27145 65 2 37163		TITLE4	BCD	4, KINETIC ENERGY LAYER 1
01607	20 6 54565 51 8 73020		TITLE4	BCD	4, KINETIC ENERGY LAYER 1
01610	20 2 02020 20 2 02020		TITLE4	BCD	4, KINETIC ENERGY LAYER 1
01611	43 6 13065 51 2 00120		TITLE4	BCD	4, KINETIC ENERGY LAYER 1
01612	75 0 01567 50 0 00000			SLJ	PRINT4
01613	75 0 00000 10 0 00012		PRINT5	SLJ ENA	** 10
01614	20 0 00017 50 0 00000			SIA	178
01615	75 0 01621 00 0 00000	+		SLJ 00	**+4 0
01616	00 0 44215 00 0 63715			00 00	FS4 FS6
01617	00 0 00047 00 0 00035			00 00	39 29
01620	00 0 00022 00 0 00010			00 00	18 8
01621	75 4 04745 00 0 00000	+		RTJ 00	WAE 0
01622	75 4 02524 00 0 63715	+		RTJ 00	MAC FS6,0
01623	75 0 01613 77 7 63715			SLJ 77	PRINT5 FS6,7

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C1624	10 0 02000 00 0 00001	10 0 00	TAU 1
C1625	00 0 00000 00 0 00000	000 0	0
C1626	20 0 00000 00 0 00000	000 0	50-1847
C1627	00 0 00000 00 0 00000	000 0	0
C1630	03 1 46314 03 1 46314	000 0	10-1847
C1631	00 0 00026 00 0 00026	000 0	22 22
C1632	20 4 27145 23 2 06545	000 0	4, KINI ENERGY DIFF
C1633	65 5 16730 20 6 47166	000 0	4, KINI ENERGY DIFF
C1634	66 2 02020 20 0 02020	000 0	4, KINI ENERGY DIFF
C1635	43 6 13065 51 2 00120	000 0	4, KINI ENERGY DIFF
C1636	75 0 01613 50 0 00000	000 0	4, KINI ENERGY DIFF
C1637	75 0 00000 10 0 00012	000 0	PRINTS
C1640	20 0 00017 50 0 00000	000 0	STA 1/8
C1641	75 0 01645 00 0 00000	000 0	++ 0
C1642	00 0 63715 00 0 14655	000 0	FS6 FS1
C1643	00 0 00047 00 0 00035	000 0	39 29
C1644	00 0 00022 00 0 00010	000 0	18 8
C1645	75 4 04745 00 0 00000	000 0	WAE 0
C1646	75 4 02524 00 0 14655	000 0	MAC FS1,0
C1647	75 0 01637 77 7 14655	000 0	PRINT6 FS1,7
C1650	10 0 02000 00 0 00001	000 0	TAU 1
C1651	00 0 00000 00 0 00000	000 0	0
C1652	20 0 00000 00 0 00000	000 0	50-1847
C1653	00 0 00000 00 0 00000	000 0	0

C1654	14 3 31463	1 FC	250-1847	
C1655	10 3 00026		22	
C1656	20 6 37045	PCD	4, CHNG IN KINETIC ENRGY LAYER 1	
C1657	20 4 27145	PCD	4, CHNG IN KINETIC ENRGY LAYER 1	
C1660	20 6 54565	PCD	4, CHNG IN KINETIC ENRGY LAYER 1	
C1661	43 6 13065	PCD	4, CHNG IN KINETIC ENRGY LAYER 1	
C1662	75 3 01637	SLJ	PRINT6	
C1663	75 0 00000	SLJ	**	
C1664	20 0 00017	STA	17B	
C1665	75 3 01671	SLJ	**4	
C1666	20 0 05015	RG	FS0	
C1667	00 0 00047	RG	FS6	
C1670	00 0 00022	RG	39	
C1671	75 4 04745	RTJ	18	
C1672	75 4 02524	RTJ	8	
C1673	75 7 63715	SLJ	WAE	
C1674	10 0 02000	RG	0	
C1675	00 0 00000	CCT	MAC	
C1676	20 0 00000	DEC	FS6,0	
C1677	00 0 00000	DEC	PRINT7	
C1700	10 0 00000	DEC	FS6,7	
C1701	00 0 00026	RG	IAU	
C1702	20 4 75146	PCD	1	
C1703	23 2 06671	BCD	0	
	65 4 36420	BCD	50-1847	
		DEC	250-2847	
		RG	22	
		RG	22	
		PCD	4, PROG KAT FIELD	LAYER 1
		BCD	4, PROG KAT FIELD	LAYER 1

	TITLE 7	RCD	4, PROG KAT FIELD	LAYER 1
01704	20 2 02120			
01705	20 2 02120			
	43 6 13065			
01706	51 2 00120		4, PROG KAT FIELD	LAYER 1
	75 3 01663			
	50 3 00000	SLJ	PRINT7	
01707	75 3 00000	SLJ	**	
	10 3 00312	INA	13	
01710	20 0 00117	STA	17B	
	50 0 00000			
01711	75 3 01715	SLJ	**4	
	00 0 00000	00	0	
01712	00 3 14555	00	FS1	
	00 3 63715	00	FS6	
01713	00 0 00007	00	39	
	00 0 00005	00	29	
01714	00 0 00022	00	18	
	00 0 00010	00	9	
01715	75 4 04745	RTJ	WAT	
	00 0 00000	00	0	
01716	75 4 02524	RTJ	MAC	
	00 0 63715	00	FS6,0	
01717	75 3 01707	SLJ	PRINT8	
	77 7 63715	77	FS6,7	
01720	10 0 02000	10	TAU	
	00 0 00001	00	1	
01721	00 0 00000	OCT	0	
	00 0 00000			
01722	20 3 00000	DEC	50-1847	
	00 3 00000			
01723	00 3 00000	OCT	0	
	00 3 00000			
01724	03 1 46314	DEC	10-1847	
	63 1 46314			
01725	00 3 00026	00	22	
	00 3 00026	00	22	
01726	20 6 16425	RCD	4, ADVEC OF OMEGA BY TEMP LAYER 1	
	65 6 32046			
01727	66 2 04644	RCD	4, ADVEC OF OMEGA BY TEMP LAYER 1	
	65 6 76120			
01730	62 3 02023	RCD	4, ADVEC OF OMEGA BY TEMP LAYER 1	
	65 4 44720			
01731	43 6 13065	RCD	4, ADVEC OF OMEGA BY TEMP LAYER 1	
	51 2 00120			
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	50 3 00000			
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	00 0 00000			

MORGAN

01734	05 5 11512 62 5 77555	CONST2	DEC	176370-5847
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01736	64 2 02002 12 1 22020	NAME1A	OCT	6420200212122020
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01760	17 7 77777 77 7 77777	COUNT1	OCT	177777777777777
01761	43 6 13065 51 2 00220	LEVEL2	OCT	4361306551200220
01762	43 6 13065 51 2 00320	LEVEL3	OCT	4361306551200320
01763	07 2 47764 15 0 14743	A2	OCT	0724776415014743

MORGAN

01764	11 3 33231 41 1 20344	A3	OCT	1133323141120344
01765	01 0 30675 72 0 26573	B2	OCT	0103067572026573
01766	01 0 30675 72 0 26573	B3	OCT	0103067572026573
01767	02 7 34000 00 0 00000	C2	OCT	0273400000000000
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01771	77 0 12577 77 7 77777	D2	OCT	7701257777777777
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01773	00 0 00000 00 0 00002	E2	OCT	2
01774	00 0 00000 00 0 00002	F3	OCT	2
01775	01776	LOCAT1	RSS	1
01776	01777	LOCAT2	BSS	1
01777	00 0 00000 50 0 01200	TAPUNIT	OCT	50001200
02000	00 0 00000 00 0 00030	TAU	DEC	24
02001	12 1 21205 12 0 10205	TIME	OCT	1212120512010605
02002	76 0 01027 50 0 00000	HATERR	SLS	MHAT
02003	76 0 01342 50 0 00000	JACERR	SLS	MOORE
02004	76 0 01006 50 0 00000	LAPERR1	SLS	LAPLAC1
02005	76 0 01014 50 0 00000	LAPERR2	SLS	LAPLAC2
02006	76 0 01274 50 0 00000	LAPERR3	SLS	LAPKIN
02007	76 0 00705 50 0 00000	READERR	SLS	READ01
02010	76 0 01137 50 0 00000	SQERR	SLS	OTHM
02011	76 0 00774 50 0 00000	VORTER1	SLS	VORTIS1
02012	76 0 01001 50 0 00000	VORTER2	SLS	VORTIS2
02013	76 0 00761 50 0 00000	WINDERR	SLS	REWIND

M000001

02014	02024	MAA	LIB	MAA
02524	04231	MAC	LIB	MAC
04231	04371	MAG	LIB	MAG
04371	04423	SAB	LIB	SAB
04423	04451	SAD	LIB	SAD
04451	04535	SAH	LIB	SAH
04535	04570	SAI	LIB	SAI
04570	04611	SAJ	LIB	SAJ
04611	04666	SAR	LIB	SAR
04666	04715	VAB	LIB	VAB
04715	04745	WAB	LIB	WAB
04745	05015	WAE	LIB	WAE
05015	14655	FS0	RSS	4000
14655	24515	FS1	RSS	4000
24515	34355	FS2	BSS	4000
34355	44215	FS3	PSS	4000
44215	54055	FS4	BSS	4000
54055	63715	FS5	RSS	4000
63715	73555	FS6	RSS	4000
73555	00000		END	

8. APPENDIX C

PRINTED FIELDS FROM THE RESEARCH PROGRAM FOR O0Z 23 FEB 65

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J020	-124	-114	-275	-250	-144	-144	-114	-114	-004	-054	-065	-094	-026	-030	-107	-040	-034	-025	-102	-020	-151
J019	-074	-074	-016	-043	-109	-003	-074	-006	-004	-022	-134	-084	-212	-184	-030	-033	-09	-059	-003	-081	-007
J018	-004	-048	-040	-044	-010	-017	-052	-044	-032	-058	-051	-004	-019	-074	-014	-051	-016	-003	-074	-049	-106
J017	-124	-030	-031	-024	-019	-005	-053	-017	-159	-013	-216	-141	-181	-065	-083	-003	-019	-136	-044	-038	-058
J016	-047	-041	-042	-057	-040	-030	-011	-019	-124	-011	-145	-057	-045	-107	-056	-004	-050	-049	-027	-151	-060
J015	-029	-084	-044	-047	-081	-042	-044	-015	-013	-011	-039	-063	-045	-093	-081	-042	-003	-112	-247	-013	-113
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+151 -099 -030 -042 -067 -091 -046 129 -203 -235 -15 -039 -232 -271 +054 +052 -194 -183 -056 -052 +015 +110
-130 +140 -086 -042 -063 -086 +054 +098 -119 -117 -039 -086 -165 +009 +020 -105 -023 +021 +057 +031 -029
-050 -119 +142 -103 +005 +030 -233 -226 -013 -064 -069 -048 +063 +078 -259 -235 +136 +040 -146 +162 -087 -650
+050 -084 -133 +065 +042 -073 -272 +021 +061 -093 -028 -057 +016 -079 -303 -121 +020 -087 -171 -154 -080 -126

1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
PROG KAT FIELD - LAYER 2 -HOG. 24 HOURS 00Z 23 FEB 65

1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021

J021	-019 +012 +002 -019 +006 -033 -026 -001 +041 +015 -002 -005 +004 -001 +006 -003 -014 -004 -011 -031 -022 -003
J020	+012 -010 -005 -015 +019 -019 +009 +071 -114 -024 -016 -024 -001 -009 +020 +024 +015 -003 -017 -013 -002 +003
J019	+029 -016 -001 -003 +02 -004 -006 -044 -057 -015 -018 -016 -000 -004 -035 -034 -026 -006 -014 -012 -002 -003
J018	+013 +007 -002 -016 -006 +005 +032 -061 -003 -021 -000 -002 -018 -017 +013 +016 +016 +020 -002 -003 -002 -000
J017	+003 -002 -004 -022 -003 +013 +017 -014 -062 -022 -02 +009 +025 -003 +001 +000 +006 +004 +001 +004 +004 +002
J016	+001 -001 -011 -008 -030 +024 -024 -040 -033 -020 -000 -032 -057 +064 +029 +000 +009 +020 +007 +009 +000
J015	+005 +000 -007 -002 -007 +026 -017 -023 -039 -001 -001 -024 +035 -068 -026 -014 -022 -013 -012 -007 -000 +000
J014	+014 +003 -001 +003 -003 -003 -017 -068 -057 +022 -003 -004 -004 -010 -004 -028 -051 -056 -029 -007 -025 -021 -001
J013	-077 +048 -009 -000 +017 -011 -245 -008 -089 -088 -088 -088 -088 -088 -088 -088 -088 -088 -088 -088 -088 -088 -088
J012	+229 +133 -005 -013 -031 -084 -333 -133 -074 -016 -009 -039 -046 -068 -008 -011 -041 -156 +146 +035 +021 +052
J011	+206 -003 -112 -066 -143 -205 -197 -090 -058 +135 +125 -050 -026 -023 -020 -057 -162 -000 +088 +051 +011 +030
J010	+035 -151 -179 -086 +131 -210 -037 -027 +090 +266 +220 +111 -001 -014 -020 -194 -165 -073 -028 -005 -011 +021
J009	-052 -073 -065 -089 -004 -001 -047 +033 -035 +131 +110 +024 -002 -008 -054 -111 -008 -017 -053 -011 +018 +058
J008	-058 -031 -002 -043 -043 -025 +094 +048 -014 +017 +041 +068 +069 +056 +055 +023 +013 -092 -102 -034 +021 +103
J007	-035 -034 -049 -087 -040 +085 -141 +043 -018 +007 +003 +086 +072 -014 -014 +087 +155 +072 +009 +002 -002 +087
J006	-015 -012 -030 -062 -04 +116 +197 +014 -040 -007 +022 +052 +023 +051 -059 -026 +106 +116 +090 +056 +021 +046
J005	-002 -003 -004 -017 +042 +173 +148 +15 -103 -025 -009 +036 -036 -022 -070 -067 -047 +017 +081 +084 +039 +020
J004	+001 +001 -006 -012 +076 +139 -066 -266 -094 +073 +026 +006 +048 +015 -004 -004 -053 -058 -004 +037 +027 +007
J003	+003 +004 +003 -014 +056 +010 -074 -181 -058 +039 +047 +007 +020 +022 +015 -003 -027 -040 -033 -004 +003 -014
J002	+002 +002 +004 -009 +023 +019 -030 -068 -045 +000 +028 +012 +005 +021 +003 -003 -003 -011 -016 -004 -003 -027
J001	+001 +000 +000 -000 -001 -009 -023 -024 -012 +005 +010 +011 -008 +011 -013 -013 +004 +009 +001 +005 -005 -013
J000	+000 -000 -000 -000 -004 -010 -008 -005 +001 +006 +005 +007 +013 +002 -031 -022 +006 +011 +004 +002 -003 -007

1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021

J021 -110 -136 -044 -41 -278 -002 -159 121 150 -001 -005 +015 -075 -219 -205 -042 -058 -083 -079 -204 -217 -127
 J020 -123 -004 -156 -51 -300 -093 -092 -102 -023 -092 -095 -062 -144 -109 -000 +051 -038 -173 +010 +179
 J019 -024 -004 -302 -129 -124 -154 -073 -032 -092 +029 -032 -245 -202 +090 +026 -091 -056 -012 -062 -058 +034 +012
 J018 -038 +015 -061 -178 -161 -019 -037 -178 -109 -017 -071 -100 -107 -123 -026 +033 -028 -054 +091 +115 -158 -175
 J017 -094 -048 +003 -133 -139 -074 -099 -065 -085 -224 -079 +200 -013 -256 -079 +036 -067 -067 +006 -032 -019 +009
 J016 -047 -005 -124 -058 -008 -149 -158 -175 -055 -166 -068 +129 -112 -110 -094 -069 -168 -161 -222 -066 +126 +011
 J015 +061 +054 -050 +073 -009 -186 -000 -305 -135 -038 -083 -044 -134 -064 -017 -202 -098 -129 -275 -090 +022 -061
 J014 -115 -050 -033 -164 -269 -103 -153 -176 -091 +014 +001 -128 -050 -047 -138 -111 -001 -064 -173 -138 -181 +003
 J013 -201 -200 +003 -137 -137 -145 -272 -163 +135 -125 -040 -026 -044 -046 +005 +169 +056 -093 +034 -034 -283 -109
 J012 -185 -284 -037 -120 -143 -019 -126 -186 -186 -062 -356 -129 -033 -106 +071 -059 -201 -397 -294 -097 -075 -338
 J011 -185 -133 -211 -142 -152 -109 -220 +069 -178 -315 -54 -014 -244 -006 -103 -143 -138 -222 -340 -079 +004 -411
 J010 -092 -093 -138 -116 -103 -216 -314 -376 -471 -343 -462 -271 +019 -158 -111 +013 +162 -277 -331 -038 -143 -297
 J009 -044 -163 +031 +021 -293 -140 -093 -254 -62 -147 -126 -261 -537 -721 -714 -275 -333 -682 -531 -119 -144 -189
 J008 -127 -132 -090 -201 -218 -063 -014 -113 +132 -082 -258 -221 -490 -659 -827 -940 -928 -933 -351 -335 -302 -255
 J007 -092 -134 -141 -229 -092 -131 -590 -393 -025 -155 -319 -190 -100 -162 -306 -635 -780 -420 -227 -378 -412 -202
 J006 -029 -094 -093 -044 -142 -254 -116 +048 -336 -180 -000 -144 -339 -395 -411 -244 -326 -369 -259 -169 -222 -190
 J005 -039 -063 -119 -111 -287 -215 -009 -175 -094 +058 -093 -223 -118 -330 -374 -128 -098 -253 -186 -127 -069 -049
 J004 -097 -059 -072 -130 -253 -085 -246 -522 +074 -051 -532 -128 -028 -062 -082 -061 -097 -187 -144 -078 -077 -064
 J003 +148 -103 -043 -056 -124 -142 -028 -051 -145 -274 -205 -047 -252 -294 +043 +049 -167 -142 -023 -048 +011 +124
 J002 -132 +138 -089 -052 -086 -105 -084 +165 -074 -117 +011 -098 -169 -013 -017 -102 -016 +032 +037 +061 +034 -002
 J001 -051 -119 +141 -104 +006 +039 -210 -201 -001 -068 -079 -059 +055 +066 -246 -222 +132 +030 -147 +157 -091 -638
 J000 -050 -084 -133 +045 +047 -063 -264 +026 +060 -098 -033 -064 +004 -081 -272 -099 +014 -098 -175 -156 -076 -123

9. APPENDIX D

THE CLEAR AIR TURBULENCE FORECAST COMPUTER PROGRAM

KAT FORECAST
BEGIN STEERING PROGRAM
COMPUTES 500 TO 300 MB LAYER

	00600	ORG	600B		PUT DATE TIME IN A REGISTER
00600	20 0 01461 50 0 00000	STA	TIME		
00601	75 4 00674 50 0 00000	RTJ	READD2	+	READS PACKED LOWER LEVEL D FIELD INTO FS4
00602	75 4 00702 50 0 00000	RTJ	UNPCKD2	+	UNPACKS LOWER LEVEL D FIELD INTO FS1
00603	75 4 00722 50 0 00000	RTJ	READT2	+	READS LOWER LEVEL TEMPERATURE FIELD INTO FS4
00604	75 4 00730 50 0 00000	RTJ	UNPCKT2	+	UNPACKS LOWER LEVEL TEMPERATURE FIELD INTO FS3
00605	75 4 00661 50 0 00000	RTJ	READD1	+	READS PACKED UPPER LEVEL D FIELD INTO FS4
00606	75 4 00667 50 0 00000	RTJ	UNPCKD1	+	UNPACKS UPPER LEVEL D FIELD INTO FS0
00607	75 4 00707 50 0 00000	RTJ	READT1	+	READS UPPER LEVEL TEMPERATURE FIELD INTO FS4
00610	75 4 00715 50 0 00000	RTJ	UNPCKT1	+	UNPACKS UPPER LEVEL TEMPERATURE FIELD INTO FS2
00611	75 4 00735 50 0 00000	RTJ	REWIND	+	REWINDS TU 3 CH 5/6
00612	75 4 00741 50 0 00000	RTJ	REWIND1	+	REWINDS TU 2 CH 5/6
00613	75 4 01274 50 0 00000	RTJ	PRINT	+	PRINTS LOWER HEIGHT FIELD
00614	75 4 00745 50 0 00000	RTJ	SINF	+	GENERATES SINE FIELD STOWS IN FS4
00615	75 4 00750 50 0 00000	RTJ	VORTIS1	+	COMPUTES VORTICITY FIELD FROM UPPER LEVEL D FIELD STOWS IN FS5
00616	75 4 00755 50 0 00000	RTJ	VORTIS2	+	COMPUTES VORTICITY FIELD FROM LOWER LEVEL D FIELD STOWS IN FS6
00617	75 4 00762 50 0 00000	RTJ	LAPLAC1	+	COMPUTES LAPLACIAN OF UPPER LEVEL VORTICITY FIELD STOWS IN FS0
00620	75 4 00770 50 0 00000	RTJ	LAPLAC2	+	COMPUTES LAPLACIAN OF LOWER LEVEL VORTICITY FIELD STOWS IN FS1

00621	75 4 00776 50 0 00000	+	RTJ	HORIZ	COMPUTES AVERAGE LAPLACIAN BETWEEN UPPER AND LOWER LEVELS STOWS IN FS5
00622	75 4 01320 50 0 00000	+	RTJ	PRINT1	PRINTS LAPLACIAN OF VORTICITY
00623	75 4 01003 50 0 00000	+	RTJ	MHAT	STOWS SCALED MAP FACTOR IN FS6
00624	75 4 01011 50 0 00000	+	RTJ	UTHM1	COMPUTES U COMPONENT OF THERMAL WIND AT LOWER LEVEL STOWS IN FS0
00625	75 4 01027 50 0 00000	+	RTJ	UTHM2	COMPUTES U COMPONENT OF THERMAL WIND AT LOWER LEVEL STOWS IN FS1
00626	75 4 01045 50 0 00000	+	RTJ	DUTHM	COMPUTES U COMPONENT DIFFERENCE BETWEEN UPPER AND LOWER LEVELS STOWS IN FS0
00627	75 4 01052 50 0 00000	+	RTJ	VTHM1	COMPUTES V COMPONENT OF THERMAL WIND AT LOWER LEVEL STOWS IN FS1
00630	75 4 01070 50 0 00000	+	PTJ	VTHM2	COMPUTES V COMPONENT OF THERMAL WIND AT UPPER LEVEL STOWS IN FS2
00631	75 4 01106 50 0 00000	+	RTJ	DVTHM	COMPUTES V COMPONENT DIFFERENCE BETWEEN UPPER AND LOWER LEVELS STOWS IN FS1
00632	75 4 01113 50 0 00000	+	RTJ	DTHM	COMPUTES VERTICAL GRADIENT OF THERMAL WIND STOWS IN FS0
00633	75 4 01343 50 0 00000	+	RTJ	PRINT2	PRINTS VERTICAL GRADIENT OF VT
00634	75 4 01123 50 0 00000	+	RTJ	KAT1	HORIZ MINUS DTHM STOWS IN FS5
00635	75 4 00674 50 0 00000	+	RTJ	READD2	SEE ABOVE
00636	75 4 00702 50 0 00000	+	PTJ	UNPCKD2	SEE ABOVE
00637	75 4 00661 50 0 00000	+	RTJ	READD1	SEE ABOVE
00640	75 4 00567 50 0 00000	+	RTJ	UNPCKD1	SEE ABOVE
00641	75 4 00735 50 0 00000	+	RTJ	REWIND	REWINDS TU 3 CH 5/6
00642	75 4 00741 50 0 00000	+	RTJ	REWIND1	REWINDS TU 2 CH 5/6
00643	75 4 00745 50 0 00000	+	RTJ	SINF	SEE ABOVE

00644	75 4 01003 50 0 00000	+	RTJ	MMAT	SEE ABOVE
00645	75 4 01130 50 0 00000	+	RTJ	UGE0S1	COMPUTES U COMPONENT OF GEOSTROPHIC WIND AT UPPER LEVEL STOMS IN FS2
00646	75 4 01146 50 0 00000	+	RTJ	UGE0S2	COMPUTES U COMPONENT OF GEOSTROPHIC WIND AT LOWER LEVEL STOMS IN FS3
00647	75 4 01164 50 0 00000	+	RTJ	UGE0S	COMPUTES AVERAGE U COMPONENT STOMS IN FS2
00650	75 4 01173 50 0 00000	+	RTJ	VGE0S1	COMPUTES V COMPONENT OF GEOSTROPHIC WIND AT UPPER LEVEL STOMS IN FS3
00651	75 4 01211 50 0 00000	+	RTJ	VGE0S2	COMPUTES V COMPONENT OF GEOSTROPHIC WIND AT LOWER LEVEL STOMS IN FS3
00652	75 4 01227 50 0 00000	+	RTJ	VGE0S	COMPUTES AVERAGE V COMPONENT STOMS IN FS0
00653	75 4 01236 50 0 00000	+	RTJ	KINETIC	COMPUTES V SQUARE STOMS IN FS0 COMPUTES V SQ DIFF STOMS IN FS4
00654	75 4 01366 50 0 00000	+	RTJ	PRINT3	PRINTS KINETIC ENERGY FIELD
00655	75 4 01246 50 0 00000	+	RTJ	KAT2	STOMS PREVIOUS TERMS IN FS0
00656	75 4 01411 50 0 00000	+	RTJ	PRINT4	PRINTS PROG KAT FIELD
00657	75 4 01253 50 0 00000	+	RTJ	LAYER2	COMPUTES 300 TO 200 MB LAYER
00660	76 0 00000 50 0 00000	+	SLS		END OF STEERING PROGRAM USES OFF LINE PRINTING
00661	75 0 00000 50 0 00000	READD1	SLJ	**	
00662	12 0 01461 16 0 01436	+	LDA LDO	TIME NAME1	
00663	75 4 03707 00 0 00000	+	RTJ 00	MAG 0.0	
00664	50 0 01472 50 0 01300	HIGHD	ENI ENI	MAA 1300B	
00665	50 0 43641 50 0 01465		ENI ENI	FS4 READERR	
00666	75 0 00661 50 0 00000		SLJ	READD1	
00667	75 0 00000 50 0 00000	UNPKD1	SLJ ENI	** 0.6	

00670	75 0 00672	+	SLJ	**2
	00 0 43641		00	FS4
00671	00 0 04441		00	FS0
	00 0 02453		00	2453B
00672	75 4 04341	+	RTJ	MAF
	50 0 00007		ENI	7
00673	75 0 00667		SLJ	UNPCKD1
	50 0 00000			
00674	75 0 00000	READD2	SLJ	**
	50 0 00000			
00675	12 0 01461	+	LDA	TIME
	16 0 01440		LDO	NAME2
00676	75 4 03707	+	RTJ	MAG
	00 0 00000		00	0,0
00677	50 0 01472		ENI	MAA
	50 0 01300		ENI	1300B
00700	50 0 43641		ENI	FS4
	50 0 01465		ENI	READER
00701	75 0 00674		SLJ	READD2
	50 0 00000			
00702	75 0 00000	UNPCKD2	SLJ	**
	50 0 00000		ENI	0,0
00703	75 1 00705	+	SLJ	**2
	00 1 43641		00	FS4
00704	00 0 14301		00	FS1
	00 0 02453		00	2453B
00705	75 4 04341	+	RTJ	WAB
	50 0 00007		ENI	7
00706	75 0 00702		SLJ	UNPCKD2
	50 0 00000			
00707	75 0 00000	READT1	SLJ	**
	50 0 00000			
00710	12 0 01461	+	LDA	TIME
	16 0 01442		LDO	NAME3
00711	75 4 03707	+	RTJ	MAG
	00 0 00000		00	0,0
00712	50 0 01472	HIGHT	ENI	MAA
	50 0 01300		ENI	1300B
00713	50 0 43641		ENI	FS4
	50 0 01465		ENI	READER
00714	75 0 00707		SLJ	READT1
	50 0 00000			
00715	75 0 00000	UNPCKT1	SLJ	**
	50 0 00000		ENI	0,0
00716	75 0 00720	+	SLJ	**2
	00 0 43641		00	FS4
00717	00 0 24141		00	FS2
	00 0 02453		00	2453B

00721	75 4 04241 50 0 00007	+	RTJ ENI	WAB 7
00722	75 0 00715 50 0 00000		SLJ	UNPKT1
00723	75 0 00000 50 0 00000	READT2	SLJ	**
00724	12 0 01461 12 0 01444	+	LDA LDQ	TIME NAME4
00725	75 4 03707 00 0 00000	+	RTJ 00	MAG 0,0
00726	50 0 01472 50 0 01305		ENI ENI	MAA 1300B
00727	50 0 43641 50 0 01465		ENI ENI	FS4 READERK
00730	75 0 00722 50 0 00000		SLJ	READT2
00731	75 0 00000 50 0 00000	UNPKT2	SLJ ENI	*P 0,6
00732	75 0 00733 00 0 43641	+	SLJ 00	*+2 FS4
00733	00 0 34001 00 0 02453		00 00	FS3 2453B
00734	75 4 04341 50 0 00007	+	RTJ ENI	WAB 7
00735	75 0 00730 50 0 00000		SLJ	UNPKT2
00736	75 0 00000 50 0 00000	REWIND	SLJ	**
00737	75 4 01472 00 0 11306	+	RTJ 00	MAA 11306B
00740	75 0 00735 50 0 00000	+	SLJ	REWIND
00741	75 0 01471 50 0 00000	+	SLJ	WINDERR
00742	75 0 00000 50 0 00000	REWIND1	SLJ	**
00743	75 4 01472 00 0 11206	+	RTJ 00	MAA 11206B
00744	75 0 00741 50 0 00000	+	SLJ	REWIND1
00745	75 0 01471 50 0 00000	+	SLJ	WINDERR
00746	75 0 00000 50 0 00000	SINF	SLJ	**
00747	75 4 04161 50 0 43641	+	RTJ ENI	SAI FS4
00748	75 0 00745 50 0 00000	+	SLJ	SINF

00750	75 4 00000 50 0 00000	VORTIS1	SLJ	**
00751	75 4 04235 50 0 43641	+	RTJ FNI	SAR FS4
00752	50 0 04441 50 0 53501		FNI FNI	FS0 FS5
00753	50 0 01467 50 0 04075		FNI FNI	VORTER1 SAH
00754	75 0 00750 50 0 00000		SLJ	VORTIS1
00755	75 0 00000 50 0 00000	VORTIS2	SLJ	**
00756	75 4 04235 50 0 43641	+	RTJ FNI	SAR FS4
00757	50 0 14301 50 0 63341		FNI FNI	FS1 FS6
00760	50 0 01470 50 0 04075		FNI FNI	VORTER2 SAH
00761	75 0 00755 50 0 00000		SLJ	VORTIS2
00762	75 0 00000 50 0 00000	LAPLAC1	SLJ	**
00763	75 4 04047 00 0 04441	+	RTJ 00	SAD FS0
00764	00 0 53501 00 0 01463		00 00	FS5 LAPERR1
00765	75 4 04075 50 0 04073	+	RTJ FNI	SAH SAD+24B
00766	50 0 04061 50 0 04061		FNI FNI	SAD+12B SAD+12B
00767	75 0 00762 50 0 00000		SLJ	LAPLAC1
00770	75 0 00000 50 0 00000	LAPLAC2	SLJ	**
00771	75 4 04047 00 0 14301	+	RTJ 00	SAD FS1
00772	00 0 63341 00 0 01464		00 00	FS6 LAPERR2
00773	75 4 04075 50 0 04073	+	RTJ FNI	SAH SAD+24B
00774	50 0 04061 50 0 04061		FNI FNI	SAD+12B SAD+12B
00775	75 0 00770 50 0 00000		SLJ	LAPLAC2
00776	75 0 00000 50 4 00000	HORIZ	SLJ FNI	** 0,4
00777	12 4 04441 14 4 14301	LOOP1	LDA ADD	FS0,4 FS1,4

01001	21 0 00001 20 4 53501		ARS STA	1 FS4
01001	54 4 01600 75 0 00777	+	ISK SLJ	76008+4 LOUPL
01002	75 0 00776 50 0 00000		SLJ	HORIZ
01003	75 0 00300 50 0 00000	MHAT	SLJ	**
01004	75 4 04214 00 0 01462	+	RTJ OO	SAJ HATERR
01005	50 0 43641 50 0 63341		ENI ENI	FS4 FS6
01006	75 4 04075 00 0 04223	+	RTJ OO	SAH SAJ+7B
01007	50 0 04223 50 0 04223		ENI ENI	SAJ+7B SAJ+7B
01010	75 0 01003 50 0 00000		SLJ	MHAT
01011	75 0 00000 50 0 00000	UTHM1	SLJ	**
01012	75 4 04075 00 0 01015	DIFI	RTJ OO	SAH OUTSID1
01013	50 0 01017 50 0 01017	+	ENI ENI	INSIDI INSIDI
01014	75 0 01011 50 0 00000	+	SLJ	UTHM1
01015	10 0 00000 20 2 04441	OUTSID1	ENA STA	0 FS0+2
01016	75 0 01012 50 0 00000		SLJ	DIFI
01017	12 2 43641 01 0 00001	INSIDI	LDA ARS	FS4+2 1
01020	14 0 01434 20 0 01455		ADD STA	CONST1 LOCAT1
01021	26 0 01455 20 0 01455		MUF STA	LOCAT1 LOCAT1
01022	12 3 24141 15 1 24141		LDA SUB	FS2+3 FS2+1
01023	20 0 01456 12 0 01435		STA LDA	LOCAT2 CONST2
01024	26 2 63341 26 0 01456		MUF MUF	FS6+2 LOCAT2
01025	27 0 01455 27 2 24141		DVF DVF	LOCAT1 FS2+2
01026	20 2 04441 75 0 01012		STA SLJ	FS0+2 DIFI
01027	75 0 00000 50 0 00000	UTHM2	SLJ	**

01030	75 4 04075 00 0 01033	01F2	RTJ 00	SAH OUTSID2
01031	50 0 01035 50 0 01035	+	ENI ENI	INSID2 INSID2
01032	75 0 01027 50 0 00000	+	SLJ	UTHM2
01033	10 0 00000 20 2 14301	OUTSID2	ENA STA	0 FS1,2
01034	75 0 01030 50 0 00000		SLJ	01F2
01035	12 2 43641 01 0 00001	INSID2	LDA ARS	FS4,2 1
01036	14 0 01434 20 0 01455		ADD STA	CONST1 LOCAT1
01037	26 0 01455 20 0 01455		MUF STA	LOCAT1 LOCAT1
01040	12 3 34201 15 1 34001		LDA SUB	FS3,3 FS3,1
01041	20 0 01456 12 0 01435		STA LDA	LOCAT2 CONST2
01042	26 2 63441 26 0 01456		MUF MUF	FS6,2 LOCAT2
01043	27 0 01455 27 2 34001		DVF DVF	LOCAT1 FS3,2
01044	20 2 14301 75 0 01030		STA SLJ	FS1,2 01F2
01045	75 0 00000 50 4 00000	OUTHM	SLJ ENI	** 0,4
01046	12 4 04441 15 4 14301	LOOP4	LDA SUB	FS0,4 FS1,4
01047	20 4 04441 50 0 00000		STA	FS0,4
01050	54 4 07600 75 0 01046	+	ISK SLJ	74008,4 LOOP4
01051	75 0 01045 50 0 00000		SLJ	OUTHM
01052	75 0 00000 50 0 00000	VTHM1	SLJ	**
01053	75 4 04075 00 0 01056	01F3	RTJ 00	SAH OUTSID3
01054	50 0 01060 50 0 01060	+	ENI ENI	INSID3 INSID3
01055	75 0 01052 50 0 00000	+	SLJ	VTHM1
01056	10 0 00000 20 2 14301	OUTSID3	FNA STA	0 FS1,2
01057	75 0 01053 50 0 00000		SLJ	01F3

C1060	12 2 43641 01 0 00001	INSID4	LDA ARS	FS4,2 I
C1061	14 0 01434 20 0 01455		ADD STA	CONST1 LOCAT1
C1062	26 0 01455 20 0 01455		MUF STA	LOCAT1 LOCAT1
C1063	12 2 24142 15 2 24140		LDA SUB	FS2+1,2 FS2-1,2
C1064	20 0 01456 12 0 01435		STA LDA	LOCAT2 CONST2
C1065	26 0 01456 26 0 01456		MUF MUF	FS6+2 LOCAT2
C1066	27 0 01455 27 2 24141		DVF DVF	LOCAT1 FS2,2
C1067	20 2 14301 75 0 01053		STA SLJ	FS1,2 DIF3
C1070	75 0 00000 50 0 00000	VTM2	SLJ	**
C1071	75 4 04075 90 0 01074	DIF4	RTJ 00	SAH OUTSID4
C1072	50 0 01076 50 0 01076	+	ENI ENI	INSID4 INSID4
C1073	75 0 01070 50 0 00000	+	SLJ	VTM2
C1074	10 0 00000 20 2 24141	OUTSID4	ENA STA	0 FS2,2
C1075	75 0 01071 50 0 00000		SLJ	DIF4
C1076	12 2 43641 01 0 00001	INSID4	LDA ARS	FS4,2 I
C1077	14 0 01434 20 0 01455		ADD STA	CONST1 LOCAT1
C1100	26 0 01455 20 0 01455		MUF STA	LOCAT1 LOCAT1
C1101	12 2 34002 15 2 34000		LDA SUB	FS3+1,2 FS3-1,2
C1102	20 0 01456 12 0 01435		STA LDA	LOCAT2 CONST2
C1103	26 2 63341 26 0 01456		MUF MUF	FS6,2 LOCAT2
C1104	27 0 01455 27 2 34001		DVF DVF	LOCAT1 FS3,2
C1105	20 2 24141 75 0 01071		STA SLJ	FS2,2 DIF4
C1106	75 0 00000 50 4 00000	DVTM	SLJ ENI	** 0,4
C1107	12 4 24141 15 4 14301	LOOP7	LDA SUB	FS2,4 FS1,4

01110	20 4 14301 50 3 00000		STA	FS1,4
01111	54 4 07600 75 3 01107	+	ISK SLJ	76008,4 LOOP7
01112	75 3 01106 50 3 00000		SLJ	DVTHM
01113	75 3 00000 50 4 00000	DTHM	SLJ ENI	** 0,4
01114	12 4 04441 26 4 04441	LOOP8	LDA MUF	FS0,4 FS0,4
01115	20 4 04441 12 4 14301		STA	FS0,4
01116	26 4 14301 14 4 04441		MUF ADD	FS1,4 FS0,4
01117	75 4 04312 50 3 01466	+	RTJ SQFRR	VAB FS0,4
01118	20 4 04441 50 1 00000	+	STA	FS0,4
01121	54 4 07600 75 3 01114	+	ISK SLJ	76008,4 LOOP8
01122	75 3 01113 50 3 00000		SLJ	DTHM
01123	75 3 00000 50 4 00000	KAT1	SLJ FNI	** 0,4
01124	12 4 53501 15 4 04441	LOOP9	LDA SUB	FS5,4 FS0,4
01125	20 4 53501 50 3 00000		STA	FS5,4
01126	54 4 07600 75 3 01124	+	ISK SLJ	76008,4 LOOP9
01127	75 3 01123 50 3 00000		SLJ	KAT1
01130	75 3 00000 50 3 00000	UGF051	SLJ	**
01131	75 4 04075 00 3 01134	DIF5	RTJ 00	SAH OUTSID5
01132	50 3 01136 50 3 01136	+	FNI ENI	INSID5 INSID5
01133	75 3 01130 50 3 00000	+	SLJ	UGF051
01134	10 3 00000 20 2 24141	OUTSID5	ENA STA	0 FS2,2
01135	75 3 01131 50 3 00000		SLJ	DIF5
01136	12 4 43641 01 3 00001	INSID5	LDA ARS	FS4,2 1
01137	14 3 01434 20 3 01455		ADD STA	CONST1 LOCAT1

01140	26 0 01455	MUF	LOCAT1
	20 0 01455	STA	LOCAT1
01141	12 3 04441	LDA	FS0,3
	15 1 04441	SUB	FS0,1
01142	20 0 01456	STA	LOCAT2
	12 0 01435	LDA	CONST2
01143	26 2 63341	MUF	FS6,2
	26 0 01456	MUF	LOCAT2
01144	27 0 01455	DVF	LOCAT1
	20 2 24141	STA	FS2,2
01145	75 0 01131	SLJ	DIF5
	50 0 00000		
01146	75 0 00000	UGEOS2	**
	50 0 00000	SLJ	
01147	75 4 04075	RTJ	SAH
	00 0 01152	00	OUTSID6
01150	50 0 01154	ENI	INSID6
	50 0 01154	ENI	INSID6
01151	75 0 01146	SLJ	UGEOS?
	50 0 00000		
01152	10 0 00000	FNA	0
	20 2 34001	STA	FS3,2
01153	75 0 01147	SLJ	DIF6
	50 0 00000		
01154	12 2 43641	LDA	FS4,2
	01 0 00001	ARS	1
01155	14 0 01434	ADD	CONST1
	20 0 01455	STA	LOCAT1
01156	26 0 01455	MUF	LOCAT1
	20 0 01455	STA	LOCAT1
01157	12 3 14301	LDA	FS1,3
	15 1 14301	SUB	FS1,1
01160	20 0 01456	STA	LOCAT2
	12 0 01435	LDA	CONST2
01161	26 2 63341	MUF	FS6,2
	26 0 01456	MUF	LOCAT2
01162	27 0 01455	DVF	LOCAT1
	20 2 34001	STA	FS3,2
01163	75 0 01147	SLJ	DIF6
	50 0 00000		
01164	75 0 00000	UGEOS	**
	50 4 00000	ENI	0,4
01165	12 4 24141	LDA	FS2,4
	05 0 00003	ALS	3
01166	20 0 01455	STA	LOCAT1
	12 4 34001	LDA	FS3,4
01167	05 0 00003	ALS	3
	14 0 01455	ADD	LOCAT1

01170	20 5 24141 50 0 00300		STA	FS2,4
01171	54 4 07600 75 0 01165	+	ISK SLJ	76008,4 LOCPI
01172	75 0 01164 50 0 00300		SLJ	UGEOS
01173	75 0 00200 50 0 00300	VGEO51	SLJ	**
01174	75 4 04775 00 0 01177	DIF7	RIJ 00	SAH OUTSID7
01175	50 0 01201 50 0 01201	+	ENI FNI	INSID7 INSID7
01176	75 0 01173 50 0 00300	+	SLJ	VGEO51
01177	10 0 00200 20 2 34301	OUTSID7	ENA STA	FS3,2
01200	75 0 01174 50 0 00300		SLJ	DIF7
01201	12 3 43641 01 0 00301	INSID7	LDA ARS	FS4,2 1
01202	14 0 01434 20 0 01455		ADD STA	CONST1 LOCAT1
01203	26 0 01455 20 0 01455		MUF STA	LOCAT1 LOCAT1
01204	12 2 04442 15 2 04440		LDA SUB	FS0+1,2 FS0-1,2
01205	20 0 01456 12 0 01435		STA LDA	LOCAT2 CONST2
01206	26 0 01456 26 0 01456		MUF MUF	FS6,2 LOCAT2
01207	27 0 01455 20 2 34001		QVF STA	LOCAT1 FS3,2
01210	75 0 01174 50 0 00300		SLJ	DIF7
01211	75 0 00300 50 0 00300	VGEO52	SLJ	**
01212	75 4 04775 00 0 01215	DIF8	RIJ 00	SAH OUTSID8
01213	50 0 01217 50 0 01217	+	ENI FNI	INSID8 INSID8
01214	75 0 01211 50 0 00300	+	SLJ	VGEO52
01215	10 0 00300 20 2 04441	OUTSID8	ENA STA	FS0,2
01216	75 0 01212 50 0 00300		SLJ	DIF8
01217	12 2 43641 01 0 00301	INSID8	LDA ARS	FS4,2 1

01220	14 0 01434	ADD	CONST
	20 0 01455	STA	LOCAT1
01221	26 0 01455	MUF	LOCAT1
	20 0 01455	STA	LOCAT1
01222	12 2 14302	LDA	FS1+1,2
	15 2 14300	SUB	FS1-1,2
01223	20 0 01456	STA	LOCAT2
	12 0 01435	LDA	CONST2
01224	26 2 63341	MUF	FS6,2
	26 0 01456	MUF	LOCAT2
01225	27 0 01455	DVF	LOCAT1
	20 2 04441	STA	FS0,2
01226	75 0 01212	SLJ	DIF8
	50 0 00000		
01227	75 0 00300	SLJ	**
	50 4 00000	ENI	0,4
01230	12 4 34001	LDA	FS3,4
	05 0 00003	ALS	3
01231	20 0 01455	STA	LOCAT1
	12 4 04441	LDA	FS0,4
01232	05 0 00003	ALS	3
	14 0 01455	ADD	LOCAT1
01233	20 4 04441	STA	FS0,4
	50 0 00000		
01234	54 4 07600	ISK	76008,4
	75 0 01230	SLJ	LOOP11
01235	75 0 01227	SLJ	VGEOS
	50 0 00000		
01236	75 0 00000	SLJ	**
	50 4 00000	ENI	0,4
01237	12 4 24141	LDA	FS2,4
	26 4 24141	MUF	FS2,4
01240	20 0 01455	STA	LOCAT1
	12 4 04441	LDA	FS0,4
01241	26 4 04441	MUF	FS0,4
	20 0 01456	STA	LOCAT2
01242	14 0 01455	ADD	LOCAT1
	01 0 00001	AKS	1
01243	20 4 04441	STA	FS0,4
	50 0 00000		
01244	54 4 07600	ISK	76008,4
	75 0 01237	SLJ	LOOP12
01245	75 0 01236	SLJ	KINETIC
	50 0 00000		
01246	75 0 00000	SLJ	**
	50 4 00000	ENI	0,4
01247	12 4 53501	LDA	FS5,4
	15 4 04441	SUB	FS0,4

01250	20 4 04441 50 0 00000	STA	FSU,4
01251	54 4 07600 75 0 01247	ISK SLJ	76008,4 LOOP13
01252	75 0 01246 50 0 00000	SLJ	KAT2
01253	75 0 00000 12 0 01446	SLJ LDA	** COUNT
01254	05 0 00001 20 0 01446	ALS STA	I COUNT
01255	22 3 01253 12 0 01437	AJPM LDA	LAYER2 NAME1A
01256	20 0 01436 12 0 01441	STA LDA	NAME1 NAME2A
01257	20 0 01440 12 0 01443	STA LDA	NAME2 NAME3A
01260	20 0 01442 12 0 01445	STA LDA	NAME3 NAME4A
01261	20 0 01444 12 0 01447	STA LDA	NAME4 LEVEL2
01262	20 0 01316 20 0 01341	STA STA	TITLE+3 TITLE1+3
01263	20 0 01364 20 0 01407	STA STA	TITLE2+3 TITLE4+3
01264	20 0 01432 12 0 01450	STA LDA	TITLE7+3 A2
01265	20 0 01306 12 0 01451	STA LDA	A1 B2
01266	20 0 01307 12 0 01452	STA LDA	B1 C2
01267	20 0 01311 12 0 01453	STA LDA	C1 D2
01270	20 0 01310 12 0 01454	STA LDA	D1 E2
01271	61 0 01305 12 0 01457	SAL LDA	E1 TAPUNIT
01272	61 0 00664 61 0 00712	SAL SAL	HIGHT HIGHT
01273	75 0 00001 50 0 00000	SLJ	START
01274	75 0 00000 10 0 77777	SLJ FNA	** 77777B
01275	20 0 00017 50 0 00000	STA	I7B
01276	75 0 01302 00 0 00000	SLJ 00	**+4 0
01277	00 0 14301 00 0 63341	00 00	FS1 FS6

01300	00 0 00147	00 0 00135	00 0 00147	39	
	00 0 00135		00 0 00135	29	
01301	00 0 00122	00 0 00110	00 0 00122	18	
	00 0 00110		00 0 00110	8	
01302	75 4 04371	00 0 00100	RTJ 00	WAE	
	00 0 00100		00	0	
01303	75 4 02202	00 0 63341	RTJ 00	MAC	
	00 0 63341		00	FS6,0	
01304	75 0 01274	77 7 63341	SLJ 77	PRINT	
	77 7 63341		77	FS6,7	
01305	00 0 01460	00 0 00004	00 00	TAU	
	00 0 00004		00	4	
01306	13 1 11710	47 6 40243	0CT	1311171047640243	
	47 6 40243		0CT		
01307	02 4 76132	61 3 70664	0CT	0247613261070664	
	61 3 70664		0CT		
01310	00 1 42600	00 0 00000	0CT	0014260000000000	
	00 0 00000		0CT		
01311	01 3 56000	00 0 00000	0CT	0135600000000000	
	00 0 00000		00 22		
01312	00 0 00026	00 0 00026	00 00	22	
	00 0 00026		00		
01313	20 4 34626	65 5 12043	PCD	4, LOWER LEVEL 2 FIELD	LAYER 1
	65 5 12043		PCD		
01314	65 2 56543	20 3 12066	BCD	4, LOWER LEVEL 2 FIELD	LAYER 1
	20 3 12066		BCD		
01315	71 6 54364	20 2 02020	BCD	4, LOWER LEVEL 2 FIELD	LAYER 1
	20 2 02020		BCD		
01316	43 6 13065	51 2 00120	BCD	4, LOWER LEVEL 2 FIELD	LAYER 1
	51 2 00120		BCD		
01317	75 0 01274	50 0 00000	SLJ	PRINT	
	50 0 00000		SLJ		
01320	75 0 00000	50 0 00000	PRINT1	**	
	50 0 00000		SLJ		
01321	75 0 01325	00 0 00000	SLJ 00	**4	
	00 0 00000		00	0	
01322	00 0 53501	00 0 63341	00 00	FS5	
	00 0 63341		00	FS6	
01323	00 0 00047	00 0 00035	00 00	39	
	00 0 00035		00	29	
01324	00 0 00022	00 0 00010	00 00	18	
	00 0 00010		00	8	
01325	75 4 04371	00 0 00000	RTJ 00	WAE	
	00 0 00000		00	0	
01326	75 4 02202	00 0 63341	RTJ 00	MAC	
	00 0 63341		00	FS6,0	
01327	75 0 01320	77 7 63341	SLJ 77	PRINT1	
	77 7 63341		77	FS6,7	

01330	00 1 01463	00 1 00101	TAU	1
01331	00 1 00000	00 1 00000	0CT	0
01332	00 1 00000	00 1 00000	DEC	50-1847
01333	00 1 00000	00 1 00000	0CT	0
01334	04 5 31463	14 5 31463	DEC	150-2847
01335	00 1 00026	00 1 00026	00	22
01336	20 2 36147	43 5 16371	BCD	4, LAPLACIAN OF VORTICITY LAYER 1
01337	61 4 52046	66 2 02546	BCD	4, LAPLACIAN OF VORTICITY LAYER 1
01340	51 2 37163	71 2 33020	BCD	4, LAPLACIAN OF VORTICITY LAYER 1
01341	43 5 13065	51 2 00120	BCD	4, LAPLACIAN OF VORTICITY LAYER 1
01342	75 1 01320	50 1 00000	SLJ	PRINT1
01343	75 1 00000	50 1 00000	SLJ	**
01344	75 0 01350	00 1 00100	SLJ	**+4
01345	00 1 04441	00 1 63341	00	FS0
01346	00 1 00047	00 1 00035	00	39
01347	00 1 00022	00 1 00010	00	18
01350	75 4 04371	00 0 00000	RTJ	WAE
01351	75 4 02202	00 1 63341	RTJ	MAC
01352	75 1 01343	77 7 63341	SLJ	FS6,0
01353	00 1 01460	00 1 00001	00	PRINT2
01354	00 1 00000	00 1 00000	00	FS6,7
01355	20 1 00000	00 1 00000	0CT	TAU
01356	00 1 00000	00 1 00000	0CT	1
01357	00 1 31463	14 5 31463	DEC	0
			DEC	50-1847
			0CT	0
			DEC	250-3047

01360	00 0 00026 00 0 00026		00 00 00 00				
01361	20 2 56551 23 2 06751	TITLE2	BCD	4, VERT GRAD GF VT		LAYER 1	
01362	61 6 42046 66 2 02523	TITLE2	PCD	4, VERT GRAD GF VT		LAYER 1	
01363	00 2 02020 20 2 02020	TITLE2	PCD	4, VERT GRAD GF VT		LAYER 1	
01364	43 6 13065 51 2 00120	TITLE2	BCD	4, VERT GRAD GF VT		LAYER 1	
01365	75 0 01343 50 0 00000		SLJ	PRINT2			
01366	75 0 00000 00 0 00000	PRINT3	SLJ	**			
01367	75 0 01373 00 0 00000	+	SLJ 00	**4 0			
01370	00 0 04441 00 0 63341		00 00	FS0 FS6			
01371	00 0 00047 00 0 00035		00 00	39 29			
01372	00 0 00022 00 0 00010		00 00	18 8			
01373	75 4 04371 00 0 00000	+	RTJ 00	WAE 0			
01374	75 4 02202 00 0 63341	+	RTJ 00	MAC FS6,0			
01375	75 0 01366 77 7 63341		SLJ 77	PRINT3 FS6,7			
01376	00 0 01460 00 0 00001		00 00	TAU 1			
01377	00 0 00000 00 0 00000		00 00	0			
01400	20 0 00000 00 0 00000		DEC	50-1847			
01401	00 0 00000 00 0 00000		00 00	0			
01402	01 4 63146 31 4 63146		DEC	50-2847			
01403	00 0 00026 00 0 00026		00 00	22 22			
01404	20 4 27145 65 2 37163	TITLE4	BCD	4, KINETIC ENERGY		LAYER 1	
01405	20 6 54565 51 6 73020	TITLE4	BCD	4, KINETIC ENERGY		LAYER 1	
01406	20 2 02020 20 2 02020	TITLE4	BCD	4, KINETIC ENERGY		LAYER 1	
01407	43 6 13065 51 2 00120	TITLE4	BCD	4, KINETIC ENERGY		LAYER 1	

01410	75 0 01366 50 0 00000		SLJ	PRINT3	
01411	75 0 00000 50 0 00000	PRINT4	SLJ	**	
01412	75 0 01416 50 0 00000	+	SLJ 00	**4 0	
01413	00 0 04441 00 0 63341		00 00	FSU FS6	
01414	00 0 00047 00 0 00035		00 00	39 29	
01415	00 0 00022 00 0 00010		00 00	18 8	
01416	75 4 04371 00 0 00000	+	RTJ 00	MAE 0	
01417	75 4 02202 00 1 63341	+	RTJ 00	MAC FS6,0	
01420	75 0 01411 77 7 63341		SLJ 77	PRINT4 FS6,7	
01421	00 0 01460 00 0 00001		00 00	TAU 1	
01422	00 0 00000 00 0 00000		00T 0	0	
01423	00 0 00000 00 0 00000		DEC	50-1847	
01424	00 0 00000 00 0 00000		00T 0	0	
01425	03 1 46314 63 1 46314		DEC	10-1847	
01426	00 0 00026 00 0 00026		00 00	22 22	
01427	20 4 75146 07 2 04261	TITLE7	000	4, PROG KAT FIELD	LAYER 1
01430	23 2 06671 65 4 36420	TITLE7	000	4, PROG KAT FIELD	LAYER 1
01431	20 2 02020 20 2 02020	TITLE7	000	4, PROG KAT FIELD	LAYER 1
01432	43 0 13065 51 2 00120	TITLE7	000	4, PROG KAT FIELD	LAYER 1
01433	75 0 01411 50 0 00000		SLJ	PRINT4	
01434	00 0 00000 00 0 00000	CONST1	DEC	50-1847	
01435	05 5 11012 62 5 77555	CONST2	DEC	176370-5847	
01436	64 2 02003 12 1 22020	NAMF1	00T	6420200312122020	
01437	64 2 02002 12 1 22020	NAMF1A	00T	6420200212122020	

01440	64 1 02 05 12 1 22 23	NAME2	PCT	6420200512122120
01441	64 1 02 03 12 1 22 20	NAME2A	PCT	6420200312122120
01442	63 1 02 03 12 1 22 20	NAME3	PCT	2320200312122120
01443	63 1 02 02 12 1 22 20	NAME3A	PCT	2320200212122120
01444	63 1 02 05 12 1 22 23	NAME4	PCT	2320200512122120
01445	63 1 02 03 12 1 22 20	NAME4A	PCT	2320200312122020
01446	77 7 77777 77 7 77777	COUNT	PCT	177777777777777
01447	43 5 13 65 51 5 00 23	LEVEL2	PCT	4361306551200220
01450	07 1 47 64 15 1 14 74	A2	PCT	0724776415014743
01451	61 1 30 675 72 1 26 573	P2	PCT	0103067572026573
01452	02 7 34 000 00 0 00 000	C2	PCT	0273400000000000
01453	77 1 12 577 77 1 77 777	D2	PCT	770125777777777
01454	00 1 00 000 00 0 00 002	F2	PCT	2
01455	01456	LOCAT1	BSS	1
01456	01457	LOCAT2	BSS	1
01457	00 0 00 000 50 0 01 200	TAPUNIT	PCT	50001200
01460	00 0 00 000 00 0 00 030	TAU	DEC	24
01461	12 1 21 205 12 1 10 005	TIME	PCT	1212120512010605
01462	76 0 01 003 50 0 00 000	HATERR	SLS	MHAT
01463	76 0 00 762 50 0 00 000	LAPERR1	SLS	LAPLAC1
01464	76 0 00 770 50 0 00 000	LAPERR2	SLS	LAPLAC2
01465	76 0 00 661 50 0 00 000	READERR	SLS	READD1
01466	76 0 01 113 50 0 00 000	SOERR	SLS	OTHM
01467	76 0 00 750 50 0 00 000	VORTEK1	SLS	VORTISI

			VORTER2	SLS	VORTIS2
0147C	76 0 00755				
	50 0 00000				
01471	76 0 00735		WINDERR	SLS	REWIND
	50 0 00000				
01472	02202		MAA	LIB	MAA
02202	03707		MAC	LIB	MAC
03707	04047		MAG	LIB	MAG
04047	04075		SAD	LIB	SAD
04075	04161		SAH	LIB	SAH
04161	04214		SAT	LIB	SAT
04214	04235		SAJ	LIB	SAJ
04235	04312		SAR	LIB	SAR
04312	04341		VAB	LIB	VAB
04341	04371		WAB	LIB	WAB
04371	04441		WAE	LIB	WAE
04441	14301		FS0	RSS	4000
14301	24141		FS1	RSS	4000
24141	34001		FS2	PSS	4000
34001	43641		FS3	RSS	4000
43641	53501		FS4	RSS	4000
53501	63341		FS5	RSS	4000
63341	73201		FS6	RSS	4000
73201	00000			END	

10. APPENDIX E

PRINTED FIELDS FROM THE CLEAR AIR TURBULENCE FORECAST
COMPUTER PROGRAM FOR 00Z 10 MARCH 65 THROUGH 12Z 13 MARCH 65

L	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
LJ021	434	558	422	290	311	442	363	365	330	411	276	215	138	064	015	013	079	203	328	403	440	491
LJ020	693	672	664	670	511	648	437	446	428	492	340	471	169	53	098	028	126	263	355	382	415	476
J019	606	602	601	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
J018	607	618	678	734	733	736	677	611	511	511	523	254	103	471	013	051	071	198	233	245	318	380
J017	762	786	780	805	805	801	767	674	552	679	373	271	148	113	026	046	034	149	202	221	279	334
J016	797	838	831	831	814	794	742	617	483	399	344	282	199	77	080	068	053	170	241	274	301	314
J015	801	821	826	803	778	765	674	552	434	354	323	301	217	116	029	035	138	248	301	325	332	315
J014	765	774	771	761	719	685	624	528	414	314	297	301	219	119	102	161	253	322	349	361	361	347
J013	702	703	702	703	672	658	580	482	426	330	333	274	236	144	210	261	325	375	399	410	413	417
J012	638	622	617	626	622	582	529	486	444	398	335	273	239	242	268	302	345	386	419	453	485	515
J011	590	576	561	566	578	559	513	456	431	391	312	231	217	233	272	326	359	373	410	478	552	609
J010	586	565	564	575	585	577	545	505	447	384	331	235	229	249	283	329	360	379	416	487	584	665
J009	632	618	623	641	641	623	587	548	508	459	389	318	288	293	307	330	363	400	439	504	600	690
J008	691	683	693	695	691	680	641	595	563	534	488	419	368	358	362	374	397	427	474	548	634	715
J007	737	732	735	733	734	732	704	665	632	590	546	504	461	457	455	449	447	469	527	606	685	754
J006	770	768	773	776	777	771	750	743	717	673	625	603	578	550	552	532	515	538	596	670	741	794
J005	794	795	802	809	811	806	796	779	759	712	687	668	655	645	621	616	626	675	735	788	823	
J004	813	814	820	827	834	836	836	833	832	798	773	752	740	735	725	704	694	711	746	786	820	842
J003	822	826	832	838	847	853	855	857	853	839	822	809	798	791	780	765	762	777	799	821	840	853
J002	829	834	840	844	852	860	865	870	872	867	858	841	837	824	814	808	810	819	830	838	843	848
J001	834	835	844	848	854	861	863	875	880	879	875	865	856	840	830	835	835	840	846	844	837	837
LJ000	838	841	846	850	854	859	866	872	880	882	882	882	882	882	882	882	882	882	882	882	882	882
L	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
M	LCWR	LEVEL	7	FIFL	LAYER	1	PRG.	24	HOURS	00Z	10	MARCH	1965									

L 100 1 001 1 002 1 003 1 004 1 005 1 006 1 007 1 008 1 009 1 010 1 011 1 012 1 013 1 014 1 015 1 016 1 017 1 018 1 019 1 020 1 021
 L J021 +014 +014 -012 -003 -003 +027 -002 -005 -034 -021 +029 +025 +021 +033 +011 -009 -033 +019 +057 -001 -085 -014
 L J020 -030 -025 +022 -014 -119 -006 -007 -017 -044 -021 +035 +047 +044 -22 -013 +019 -037 +028 +065 -010 -062 -010
 J019 +014 -002 +051 +047 -034 -003 +032 +030 +047 -001 -003 -026 -042 -016 -001 +015 +035 -003 -011 +053 +035
 J018 +040 +043 +058 +015 +066 +037 -004 +024 +051 +048 +017 -028 -036 -028 -026 -014 +024 +058 -019 -080 +005 +030
 J017 -014 -001 -020 -011 -004 +018 +023 +012 -002 +011 -022 -004 +030 -030 -024 +011 -034 -002 -003 -071 -047 -000
 J016 -028 -015 +014 +014 -024 -008 +078 -015 -072 -047 -010 +004 +041 +061 -016 -054 -056 -006 +020 -022 +014 +003
 J015 +031 +056 +023 -022 -014 +048 +018 -091 -025 +025 +019 +032 +013 -026 -015 -087 -015 +042 -016 +029 +048 +013
 J014 +025 +040 +021 -015 -054 -008 +015 -054 -002 -078 -041 +103 -009 -130 -073 -040 +068 +010 -031 -005 +022 -008
 J013 -011 -040 -000 +024 -010 -053 -027 +114 -010 -158 -044 +071 -015 -020 -019 +035 +038 +033 -004 -010 -022 -050
 J012 +005 +007 -030 -023 +095 -001 -073 -010 +053 +098 +073 -011 -011 +065 +062 -034 -044 -027 +029 -001 -019 -027
 J011 -013 +043 -045 -115 -015 +020 -055 -118 -014 +126 -038 -060 -062 -041 -005 +069 -023 -079 -030 +040 +043 +038
 J010 -083 -035 -050 -045 -044 +077 -003 -055 -051 -096 -082 -071 -004 -005 +056 +029 -021 -011 -004 +037 +054
 J009 -072 -057 +096 +102 +037 -054 +000 -054 +000 -032 +069 +056 -054 -076 -033 +065 -000 -077 -021 +029
 J008 +011 -001 +054 -000 -014 -011 -037 -009 -014 +048 +112 -007 -037 -017 -057 -030 +046 -003 -043 -029 -031 +003
 J007 +008 +020 -037 -088 -027 +054 +021 +005 -002 -053 -021 -023 -082 -015 +056 +033 -008 -038 -019 +004 -003 +004
 J006 -038 +013 +034 -029 +019 +057 -037 -067 +075 -018 -076 +052 -017 -051 +002 -095 -025 -005 +004 +038 +012
 J005 -014 +014 +025 -011 -010 -008 -011 -023 +032 +047 +015 +040 +034 -009 +028 -019 -053 -047 -009 +036 +026 +001
 J004 +004 +19 -011 -036 -037 +006 +047 +042 -014 -027 -016 -024 -007 +026 +035 +037 -007 -026 -008 +025 -008 -013
 J003 -017 -002 +000 -005 +001 +030 -021 -040 -011 -006 -022 -000 -015 +011 +042 -028 -030 +043 +042 -011 +025 +026
 J002 -020 -007 +002 +007 +024 +014 -039 -032 +023 +016 +019 +034 -004 -012 -024 -024 -016 +036 +013 -017 -036 +046
 J001 -016 +09 +011 -003 -008 +005 +016 +013 +011 +007 -019 -009 +031 -025 -088 +002 +045 -003 +017 -008 -068 -054
 L J000 +034 -030 -004 -003 -029 +006 +014 +002 -009 +019 -006 -059 +021 +028 -075 -055 +015 +011 +023 +008 -084 -059
 L 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
 L M LAPLACIAN CP VERTICITY LAYER 1 24 HOURS 00Z 10 MARCH 1965

TIME	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022
L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022
LJ021	+100	+98	+96	+93	+91	+89	+87	+85	+83	+81	+79	+77	+75	+73	+71	+69	+67	+65	+63	+61	+59	+57	+55
LJ020	+113	+121	+128	+135	+142	+149	+156	+163	+170	+177	+184	+191	+198	+205	+212	+219	+226	+233	+240	+247	+254	+261	+268
J019	+082	+107	+119	+134	+148	+161	+175	+189	+202	+216	+229	+243	+256	+269	+283	+296	+309	+323	+336	+349	+363	+376	+389
J018	+034	+044	+052	+062	+071	+080	+089	+098	+107	+116	+125	+134	+143	+152	+161	+170	+179	+188	+197	+206	+215	+224	+233
J017	+013	+016	+016	+012	+008	+006	+004	+002	+000	+001	+003	+005	+007	+009	+011	+013	+015	+017	+019	+021	+023	+025	+027
J016	+005	+005	+001	+002	+007	+012	+017	+022	+027	+032	+037	+042	+047	+052	+057	+062	+067	+072	+077	+082	+087	+092	+097
J015	+006	+007	+012	+015	+023	+027	+031	+035	+039	+043	+047	+051	+055	+059	+063	+067	+071	+075	+079	+083	+087	+091	+095
J014	+026	+035	+023	+023	+039	+054	+064	+065	+066	+067	+068	+069	+070	+071	+072	+073	+074	+075	+076	+077	+078	+079	+080
J013	+055	+065	+062	+062	+066	+070	+073	+076	+079	+081	+084	+087	+090	+093	+096	+099	+102	+105	+108	+111	+114	+117	+120
J012	+044	+044	+044	+044	+044	+044	+044	+044	+044	+044	+044	+044	+044	+044	+044	+044	+044	+044	+044	+044	+044	+044	+044
J011	+019	+005	+002	+003	+001	+011	+025	+012	+006	+024	+048	+022	+090	+010	+021	+015	+006	+009	+027	+045	+064	+090	+090
J010	+048	+048	+048	+048	+048	+048	+048	+048	+048	+048	+048	+048	+048	+048	+048	+048	+048	+048	+048	+048	+048	+048	+048
J009	+119	+094	+095	+075	+053	+055	+064	+077	+077	+088	+111	+083	+048	+030	+016	+018	+022	+022	+036	+079	+108	+078	+078
J008	+109	+094	+062	+045	+048	+067	+080	+092	+100	+104	+131	+139	+083	+068	+068	+068	+068	+068	+068	+068	+068	+068	+068
J007	+060	+062	+047	+037	+042	+059	+081	+095	+121	+126	+133	+166	+155	+132	+130	+090	+061	+068	+124	+160	+140	+084	+084
J006	+032	+038	+040	+039	+036	+042	+064	+080	+105	+139	+152	+189	+200	+176	+153	+128	+101	+125	+170	+169	+119	+061	+061
J005	+016	+020	+022	+023</																			

	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
LJ021	+391	+392	+393	+394	+395	+396	+397	+398	+399	+400	+401	+402	+403	+404	+405	+406	+407	+408	+409	+410	+411
LJ020	+391	+392	+393	+394	+395	+396	+397	+398	+399	+400	+401	+402	+403	+404	+405	+406	+407	+408	+409	+410	+411
J019	+324	+325	+326	+327	+328	+329	+330	+331	+332	+333	+334	+335	+336	+337	+338	+339	+340	+341	+342	+343	+344
J018	+334	+335	+336	+337	+338	+339	+340	+341	+342	+343	+344	+345	+346	+347	+348	+349	+350	+351	+352	+353	+354
J017	+338	+339	+340	+341	+342	+343	+344	+345	+346	+347	+348	+349	+350	+351	+352	+353	+354	+355	+356	+357	+358
J016	+361	+362	+363	+364	+365	+366	+367	+368	+369	+370	+371	+372	+373	+374	+375	+376	+377	+378	+379	+380	+381
J015	+363	+364	+365	+366	+367	+368	+369	+370	+371	+372	+373	+374	+375	+376	+377	+378	+379	+380	+381	+382	+383
J014	+339	+340	+341	+342	+343	+344	+345	+346	+347	+348	+349	+350	+351	+352	+353	+354	+355	+356	+357	+358	+359
J013	+330	+331	+332	+333	+334	+335	+336	+337	+338	+339	+340	+341	+342	+343	+344	+345	+346	+347	+348	+349	+350
J012	+321	+322	+323	+324	+325	+326	+327	+328	+329	+330	+331	+332	+333	+334	+335	+336	+337	+338	+339	+340	+341
J011	+316	+317	+318	+319	+320	+321	+322	+323	+324	+325	+326	+327	+328	+329	+330	+331	+332	+333	+334	+335	+336
J010	+319	+320	+321	+322	+323	+324	+325	+326	+327	+328	+329	+330	+331	+332	+333	+334	+335	+336	+337	+338	+339
J009	+330	+331	+332	+333	+334	+335	+336	+337	+338	+339	+340	+341	+342	+343	+344	+345	+346	+347	+348	+349	+350
J008	+342	+343	+344	+345	+346	+347	+348	+349	+350	+351	+352	+353	+354	+355	+356	+357	+358	+359	+360	+361	+362
J007	+351	+352	+353	+354	+355	+356	+357	+358	+359	+360	+361	+362	+363	+364	+365	+366	+367	+368	+369	+370	+371
J006	+356	+357	+358	+359	+360	+361	+362	+363	+364	+365	+366	+367	+368	+369	+370	+371	+372	+373	+374	+375	+376
J005	+360	+361	+362	+363	+364	+365	+366	+367	+368	+369	+370	+371	+372	+373	+374	+375	+376	+377	+378	+379	+380
J004	+363	+364	+365	+366	+367	+368	+369	+370	+371	+372	+373	+374	+375	+376	+377	+378	+379	+380	+381	+382	+383
J003	+364	+365	+366	+367	+368	+369	+370	+371	+372	+373	+374	+375	+376	+377	+378	+379	+380	+381	+382	+383	+384
J002	+365	+366	+367	+368	+369	+370	+371	+372	+373	+374	+375	+376	+377	+378	+379	+380	+381	+382	+383	+384	+385
J001	+365	+366	+367	+368	+369	+370	+371	+372	+373	+374	+375	+376	+377	+378	+379	+380	+381	+382	+383	+384	+385
LJ000	+365	+366	+367	+368	+369	+370	+371	+372	+373	+374	+375	+376	+377	+378	+379	+380	+381	+382	+383	+384	+385
L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020
L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020

00Z 10 MARCH 1965

24 HOURS

PRG.

LAYER 2

24 HOURS

L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
LJ021	-044	-021	-007	-077	+065	+004	-042	-016	-010	-031	+037	+038	+024	+032	+000	-013	-011	+015	+082	+024	-093	-030
LJ020	-112	-036	+007	-055	-146	-099	-016	-003	-034	-037	+027	+050	+021	-18	-036	+035	-045	+041	+071	-021	-077	-009
J019	+026	+005	+107	+140	-047	+034	+119	+021	+014	+010	-019	-002	-032	-69	-010	+035	+041	+070	-033	+048	+049	
J018	+078																					
J017	-062	-010	-039	-004	+007	-043	-028	+014	+038	+068	+008	-036	-035	-049	-028	+017	+034	+030	-012	+037	+011	+017
J016	-076																					
J015	+050	+081	+077	-061	-066	+075	+032	-039	-027	+029	+020	+033	+027	-011	-061	+012	+027	+007	+033	+061	+027	
J014	+061	+047	+025	-001	-069	-028	+031	-004	-027	-071	-022	+090	+000	-121	-073	+053	+092	+07	-029	+029	+049	-020
J013	-012	-050	-001	+039	+009	-051	+027	+036	-037	-148	-046	+066	+039	+030	+053	+036	+032	+028	-002	-073	-034	-079
J012	-014	-001	-047	+007	+094	+015	-007	-033	+046	+074	+048	-002	-011	+054	+067	-023	-047	+020	-010	-027	-044	-030
J011	-034	+045	-004	-134	-063	+054	-033	-107	+025	+148	+048	-067	-064	-044	+001	+068	-039	-092	-033	+070	+065	+047
J010	-130	-056																				
J009	-098	-088	+126	+140	+048																	
J008	+044	-006	+002	+062	+045																	
J007	+038	+143	-064	-124	-017	-044	-016	-077	+047	-029	-19	-014	-132	-066	+065	+030	-022	-017	-028	-025	-002	+011
J006	-041	+044	+010	-077	+041	+103	-021	-084	+075	-019	-077	+00	-026	-073	+085	-002	-124	+009	+069	+025	+026	+004
J005	-014	+022	+048	+019	+005	+009	+014	+005	+029	+025	+003	+056	+062	+034	+040	+044	-037	-091	+050	+000	+011	+002
J004	+010	+014	-006	-045	-067	+015	+056	-004	-060	-001	+020	-011	+013	+019	+029	+075	+011	-063	-014	+024	+000	-007
J003	-014	-003	+007	+010	+044	+044	+009	-009	-009	+022	-021	-005	-007	+021	+039	-041	-001	+092	-010	-060	+030	+033
J002	-019	-013	+003	+030	+037	+008	-037	-018	+048	+017	-008	+024	+006	+006	+018	-031	-038	+049	+036	-024	+020	+048
J001	+001	+004	+006	-012	-005	+014	+020	+009	+010	+002	-035	+009	+035	-72	-079	+040	-001	-082	+031	+034	-057	-060
LJ000	+017	-016	-002	-022	-020	+013	+020	+006	-005	+017	-023	-056	+024	+24	-058	-057	-013	+034	+013	+011	-032	-037
L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
L																						

LAPLACIAN CF VORTICITY LAYER 2

00Z 10 MARCH 1965

24 HOURS

00Z 10 MARCH 1965

24 HOURS

LAPLACIAN CF VORTICITY LAYER 2

[illegible]

J021	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
J021	+456	+424	+430	+440	+440	+443	+421	+362	+300	+254	+219	+181	+138	+090	+044	+067	+166	+266	+344	+405	+453	+507
J020	+520	+533	+543	+551	+542	+487	+415	+357	+317	+299	+259	+176	+078	+006	+040	+150	+248	+308	+374	+419	+461	
	888888888888				888888	7777	6666666666	555	444	333	44	555	6666									
J019	+615	+631	+642	+651	+657	+634	+569	+479	+401	+359	+321	+243	+125	+000	+921	+949	+064	+175	+251	+319	+376	+420
	11111111111111111111	888	777777	666	555	44	333	44	333	44	5555	6666										
J018	+696	+729	+743	+744	+741	+721	+664	+568	+479	+422	+344	+226	+087	+946	+872	+900	+906	+106	+199	+277	+343	+391
	22222222222222222222	111	888	7777	666	55	44	33	333	44	555	6666										
J017	+752	+794	+820	+819	+802	+777	+731	+648	+550	+465	+375	+257	+097	+940	+871	+893	+968	+064	+162	+264	+332	+363
	22222222222222222222	111	888	777	666	55	44	33	333	44	555	6666										
J016	+779	+818	+846	+846	+820	+779	+725	+651	+559	+456	+365	+269	+127	+990	+922	+919	+992	+107	+209	+297	+349	+363
	22222222222222222222	111	888	777	666	55	44	33	333	44	555	6666										
J015	+770	+795	+810	+804	+778	+732	+662	+586	+498	+393	+322	+266	+169	+076	+019	+012	+097	+226	+317	+357	+372	+379
	22222222222222222222	111	888	77	66666666	555	444444444444	555	6666													
J014	+731	+737	+742	+732	+703	+651	+586	+516	+407	+296	+279	+288	+225	+150	+114	+137	+221	+308	+362	+379	+377	+395
	11111111111111111111	88888	777	666	66666666	5555	5555	5555	5555	5555	5555	5555	5555	5555	5555	5555	5555	5555	5555	5555	5555	5555
J013	+669	+659	+658	+655	+627	+574	+522	+460	+360	+271	+279	+311	+262	+187	+172	+219	+287	+334	+359	+371	+387	+429
	88888888	77777	6666666666666666	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555
J012	+601	+584	+583	+579	+570	+549	+506	+445	+387	+344	+327	+306	+245	+193	+205	+252	+298	+331	+351	+381	+426	+486
	88888888888888888888	777777	6666	6666666666666666	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555
J011	+562	+541	+533	+533	+554	+558	+519	+464	+423	+405	+365	+281	+213	+202	+226	+266	+300	+312	+336	+402	+475	+543
	88888888888888888888	7777777777	666	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555
J010	+577	+548	+533	+546	+584	+578	+533	+484	+449	+431	+382	+281	+212	+216	+238	+266	+301	+326	+365	+441	+528	+606
	888888888888	77777777	666	555555	555555	555555	555555	555555	555555	555555	555555	555555	555555	555555	555555	555555	555555	555555	555555	555555	555555	555555
J009	+629	+604	+604	+619	+633	+619	+577	+537	+508	+475	+414	+315	+238	+237	+267	+287	+323	+380	+439	+508	+593	+677
	11111111111111111111	88888888	7777	6666	6666666666666666	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555
J008	+689	+674	+682	+686	+683	+671	+645	+620	+586	+536	+467	+373	+314	+323	+347	+366	+396	+444	+507	+579	+654	+724
	11111111111111111111	888888	7777	6666	6666666666666666	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555
J007	+738	+728	+730	+736	+736	+724	+709	+696	+654	+596	+543	+484	+448	+446	+452	+464	+476	+501	+561	+640	+706	+758
	22222222222222222222	111111	888888	7777	6666	6666666666666666	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555
J006	+771	+767	+770	+778	+780	+773	+765	+758	+724	+672	+638	+612	+577	+549	+547	+549	+545	+567	+625	+700	+762	+801
	22222222222222222222	1111111111	88888888	777	6666666666666666	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555
J005	+795	+794	+798	+802	+808	+807	+800	+798	+787	+753	+719	+700	+674	+648	+643	+641	+636	+656	+703	+762	+810	+838
	22222222222222222222	1111111111	888888	7777	6666	6666666666666666	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555
J004	+811	+813	+815	+820	+830	+832	+826	+828	+830	+814	+786	+764	+749	+737	+734	+734	+734	+747	+777	+813	+843	+860
	22222222222222222222	1111111111	888888	7777	6666	6666666666666666	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555
J003	+821	+825	+828	+834	+844	+853	+856	+859	+860	+852	+838	+820	+803	+795	+796	+800	+804	+812	+828	+847	+863	+872
	22222222222222222222	1111111111	888888	7777	6666	6666666666666666	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555	5555555555
J002	+829	+833	+837	+842	+851	+863	+873	+878	+879	+875	+867	+855	+840	+833	+836	+840	+844	+848	+855	+864	+871	+874
	33333333333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333	333333333333
J001	+835	+838	+842	+848	+854	+863	+873	+882	+886	+885	+879	+870	+860	+857	+860	+863	+864	+864	+864	+868	+870	+867
J000	+838	+841	+845	+850	+854	+861	+870	+880	+886	+886	+883	+874	+865	+865	+869	+871	+871	+868	+864	+865	+863	+852
	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021

LOWER LEVEL 2 FIELD LAYER 1
24 HOURS
12Z 10 MARCH 1965

PROG KA1 FIELD LAYER 1

J021	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
J020	+899	+893	+893	+892	+891	+883	+876	+873	+870	+864	+858	+850	+839	+835	+845	+861	+873	+884	+892	+895	+900	
	+913	+909	+909	+904	+907	+905	+895	+884	+881	+879	+875	+869	+856	+841	+835	+844	+858	+868	+877	+881	+895	
J019	+928	+926	+925	+924	+921	+916	+907	+895	+888	+886	+879	+866	+849	+835	+829	+832	+844	+859	+870	+887	+893	
J018	+936	+938	+937	+935	+932	+928	+920	+909	+901	+895	+883	+864	+844	+830	+824	+825	+835	+852	+865	+875	+884	
J017	+939	+943	+944	+942	+940	+938	+931	+922	+912	+901	+887	+869	+847	+830	+824	+824	+832	+846	+861	+874	+882	
J016	+940	+945	+947	+944	+939	+933	+924	+914	+899	+884	+870	+851	+835	+828	+827	+835	+851	+867	+878	+884	+888	
J015	+938	+942	+944	+944	+941	+934	+926	+916	+904	+888	+876	+867	+855	+844	+838	+837	+848	+866	+880	+886	+889	
J014	+934	+935	+935	+931	+923	+914	+904	+889	+874	+870	+870	+870	+863	+854	+849	+853	+864	+876	+885	+888	+890	
J013	+925	+923	+924	+925	+920	+912	+903	+894	+881	+870	+870	+874	+868	+857	+857	+865	+874	+890	+886	+889	+890	
J012	+912	+910	+914	+915	+911	+907	+901	+892	+884	+877	+875	+873	+864	+857	+861	+871	+878	+883	+890	+896	+900	
J011	+907	+904	+906	+908	+909	+903	+895	+889	+886	+880	+870	+861	+858	+863	+871	+877	+882	+891	+904	+914	+919	
J010	+914	+910	+909	+912	+917	+915	+908	+901	+894	+891	+884	+871	+862	+861	+865	+870	+876	+882	+891	+907	+920	
J009	+928	+923	+923	+927	+929	+926	+920	+913	+906	+898	+889	+876	+867	+866	+869	+873	+880	+889	+898	+911	+925	
J008	+940	+937	+937	+938	+937	+936	+932	+928	+921	+911	+899	+885	+879	+878	+879	+882	+889	+898	+908	+919	+932	
J007	+950	+948	+946	+944	+943	+942	+941	+939	+932	+925	+915	+903	+895	+894	+895	+896	+900	+907	+917	+929	+940	
J006	+956	+955	+953	+951	+951	+949	+947	+942	+936	+931	+924	+916	+913	+912	+912	+912	+918	+928	+939	+948	+955	
J005	+960	+959	+957	+957	+957	+955	+953	+951	+947	+943	+939	+935	+932	+930	+929	+928	+932	+939	+948	+955	+960	
J004	+962	+962	+962	+960	+960	+960	+960	+959	+958	+955	+952	+950	+948	+946	+945	+944	+944	+945	+950	+955	+959	
J003	+964	+964	+964	+963	+962	+963	+963	+963	+963	+963	+963	+963	+963	+963	+963	+963	+963	+963	+963	+963	+965	
J002	+965	+965	+965	+965	+965	+966	+966	+966	+966	+966	+966	+966	+966	+966	+966	+966	+966	+966	+966	+966	+966	
J001	+965	+965	+965	+966	+966	+967	+967	+967	+967	+967	+967	+967	+967	+967	+967	+967	+967	+967	+967	+967	+965	
J000	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	

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PROG. 24 HOURS

LAPLACIAN OF VORTICITY LAYER 2

1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
 +119 +114 +118 +128 +137 +146 +154 +162 +170 +178 +186 +194 +202 +210 +218 +226 +234 +242 +250 +258 +266 +274 +282 +290 +298 +306 +314 +322 +330 +338 +346 +354 +362 +370 +378 +386 +394 +402 +410 +418 +426 +434 +442 +450 +458 +466 +474 +482 +490 +498 +506 +514 +522 +530 +538 +546 +554 +562 +570 +578 +586 +594 +602 +610 +618 +626 +634 +642 +650 +658 +666 +674 +682 +690 +698 +706 +714 +722 +730 +738 +746 +754 +762 +770 +778 +786 +794 +802 +810 +818 +826 +834 +842 +850 +858 +866 +874 +882 +890 +898 +906 +914 +922 +930 +938 +946 +954 +962 +970 +978 +986 +994 +1002 +1010 +1018 +1026 +1034 +1042 +1050 +1058 +1066 +1074 +1082 +1090 +1098 +1106 +1114 +1122 +1130 +1138 +1146 +1154 +1162 +1170 +1178 +1186 +1194 +1202 +1210 +1218 +1226 +1234 +1242 +1250 +1258 +1266 +1274 +1282 +1290 +1298 +1306 +1314 +1322 +1330 +1338 +1346 +1354 +1362 +1370 +1378 +1386 +1394 +1402 +1410 +1418 +1426 +1434 +1442 +1450 +1458 +1466 +1474 +1482 +1490 +1498 +1506 +1514 +1522 +1530 +1538 +1546 +1554 +1562 +1570 +1578 +1586 +1594 +1602 +1610 +1618 +1626 +1634 +1642 +1650 +1658 +1666 +1674 +1682 +1690 +1698 +1706 +1714 +1722 +1730 +1738 +1746 +1754 +1762 +1770 +1778 +1786 +1794 +1802 +1810 +1818 +1826 +1834 +1842 +1850 +1858 +1866 +1874 +1882 +1890 +1898 +1906 +1914 +1922 +1930 +1938 +1946 +1954 +1962 +1970 +1978 +1986 +1994 +2002 +2010 +2018 +2026 +2034 +2042 +2050 +2058 +2066 +2074 +2082 +2090 +2098 +2106 +2114 +2122 +2130 +2138 +2146 +2154 +2162 +2170 +2178 +2186 +2194 +2202 +2210 +2218 +2226 +2234 +2242 +2250 +2258 +2266 +2274 +2282 +2290 +2298 +2306 +2314 +2322 +2330 +2338 +2346 +2354 +2362 +2370 +2378 +2386 +2394 +2402 +2410 +2418 +2426 +2434 +2442 +2450 +2458 +2466 +2474 +2482 +2490 +2498 +2506 +2514 +2522 +2530 +2538 +2546 +2554 +2562 +2570 +2578 +2586 +2594 +2602 +2610 +2618 +2626 +2634 +2642 +2650 +2658 +2666 +2674 +2682 +2690 +2698 +2706 +2714 +2722 +2730 +2738 +2746 +2754 +2762 +2770 +2778 +2786 +2794 +2802 +2810 +2818 +2826 +2834 +2842 +2850 +2858 +2866 +2874 +2882 +2890 +2898 +2906 +2914 +2922 +2930 +2938 +2946 +2954 +2962 +2970 +2978 +2986 +2994 +3002 +3010 +3018 +3026 +3034 +3042 +3050 +3058 +3066 +3074 +3082 +3090 +3098 +3106 +3114 +3122 +3130 +3138 +3146 +3154 +3162 +3170 +3178 +3186 +3194 +3202 +3210 +3218 +3226 +3234 +3242 +3250 +3258 +3266 +3274 +3282 +3290 +3298 +3306 +3314 +3322 +3330 +3338 +3346 +3354 +3362 +3370 +3378 +3386 +3394 +3402 +3410 +3418 +3426 +3434 +3442 +3450 +3458 +3466 +3474 +3482 +3490 +3498 +3506 +3514 +3522 +3530 +3538 +3546 +3554 +3562 +3570 +3578 +3586 +3594 +3602 +3610 +3618 +3626 +3634 +3642 +3650 +3658 +3666 +3674 +3682 +3690 +3698 +3706 +3714 +3722 +3730 +3738 +3746 +3754 +3762 +3770 +3778 +3786 +3794 +3802 +3810 +3818 +3826 +3834 +3842 +3850 +3858 +3866 +3874 +3882 +3890 +3898 +3906 +3914 +3922 +3930 +3938 +3946 +3954 +3962 +3970 +3978 +3986 +3994 +4002 +4010 +4018 +4026 +4034 +4042 +4050 +4058 +4066 +4074 +4082 +4090 +4098 +4106 +4114 +4122 +4130 +4138 +4146 +4154 +4162 +4170 +4178 +4186 +4194 +4202 +4210 +4218 +4226 +4234 +4242 +4250 +4258 +4266 +4274 +4282 +4290 +4298 +4306 +4314 +4322 +4330 +4338 +4346 +4354 +4362 +4370 +4378 +4386 +4394 +4402 +4410 +4418 +4426 +4434 +4442 +4450 +4458 +4466 +4474 +4482 +4490 +4498 +4506 +4514 +4522 +4530 +4538 +4546 +4554 +4562 +4570 +4578 +4586 +4594 +4602 +4610 +4618 +4626 +4634 +4642 +4650 +4658 +4666 +4674 +4682 +4690 +4698 +4706 +4714 +4722 +4730 +4738 +4746 +4754 +4762 +4770 +4778 +4786 +4794 +4802 +4810 +4818 +4826 +4834 +4842 +4850 +4858 +4866 +4874 +4882 +4890 +4898 +4906 +4914 +4922 +4930 +4938 +4946 +4954 +4962 +4970 +4978 +4986 +4994 +5002 +5010 +5018 +5026 +5034 +5042 +5050 +5058 +5066 +5074 +5082 +5090 +5098 +5106 +5114 +5122 +5130 +5138 +5146 +5154 +5162 +5170 +5178 +5186 +5194 +5202 +5210 +5218 +5226 +5234 +5242 +5250 +5258 +5266 +5274 +5282 +5290 +5298 +5306 +5314 +5322 +5330 +5338 +5346 +5354 +5362 +5370 +5378 +5386 +5394 +5402 +5410 +5418 +5426 +5434 +5442 +5450 +5458 +5466 +5474 +5482 +5490 +5498 +5506 +5514 +5522 +5530 +5538 +5546 +5554 +5562 +5570 +5578 +5586 +5594 +5602 +5610 +5618 +5626 +5634 +5642 +5650 +5658 +5666 +5674 +5682 +5690 +5698 +5706 +5714 +5722 +5730 +5738 +5746 +5754 +5762 +5770 +5778 +5786 +5794 +5802 +5810 +5818 +5826 +5834 +5842 +5850 +5858 +5866 +5874 +5882 +5890 +5898 +5906 +5914 +5922 +5930 +5938 +5946 +5954 +5962 +5970 +5978 +5986 +5994 +6002 +6010 +6018 +6026 +6034 +6042 +6050 +6058 +6066 +6074 +6082 +6090 +6098 +6106 +6114 +6122 +6130 +6138 +6146 +6154 +6162 +6170 +6178 +6186 +6194 +6202 +6210 +6218 +6226 +6234 +6242 +6250 +6258 +6266 +6274 +6282 +6290 +6298 +6306 +6314 +6322 +6330 +6338 +6346 +6354 +6362 +6370 +6378 +6386 +6394 +6402 +6410 +6418 +6426 +6434 +6442 +6450 +6458 +6466 +6474 +6482 +6490 +6498 +6506 +6514 +6522 +6530 +6538 +6546 +6554 +6562 +6570 +6578 +6586 +6594 +6602 +6610 +6618 +6626 +6634 +6642 +6650 +6658 +6666 +6674 +6682 +6690 +6698 +6706 +6714 +6722 +6730 +6738 +6746 +6754 +6762 +6770 +6778 +6786 +6794 +6802 +6810 +6818 +6826 +6834 +6842 +6850 +6858 +6866 +6874 +6882 +6890 +6898 +6906 +6914 +6922 +6930 +6938 +6946 +6954 +6962 +6970 +6978 +6986 +6994 +7002 +7010 +7018 +7026 +7034 +7042 +7050 +7058 +7066 +7074 +7082 +7090 +7098 +7106 +7114 +7122 +7130 +7138 +7146 +7154 +7162 +7170 +7178 +7186 +7194 +7202 +7210 +7218 +7226 +7234 +7242 +7250 +7258 +7266 +7274 +7282 +7290 +7298 +7306 +7314 +7322 +7330 +7338 +7346 +7354 +7362 +7370 +7378 +7386 +7394 +7402 +7410 +7418 +7426 +7434 +7442 +7450 +7458 +7466 +7474 +7482 +7490 +7498 +7506 +7514 +7522 +7530 +7538 +7546 +7554 +7562 +7570 +7578 +7586 +7594 +7602 +7610 +7618 +7626 +7634 +7642 +7650 +7658 +7666 +7674 +7682 +7690 +7698 +7706 +7714 +7722 +7730 +7738 +7746 +7754 +7762 +7770 +7778 +7786 +7794 +7802 +7810 +7818 +7826 +7834 +7842 +7850 +7858 +7866 +7874 +7882 +7890 +7898 +7906 +7914 +7922 +7930 +7938 +7946 +7954 +7962 +7970 +7978 +7986 +7994 +8002 +8010 +8018 +8026 +8034 +8042 +8050 +8058 +8066 +8074 +8082 +8090 +8098 +8106 +8114 +8122 +8130 +8138 +8146 +8154 +8162 +8170 +8178 +8186 +8194 +8202 +8210 +8218 +8226 +8234 +8242 +8250 +8258 +8266 +8274 +8282 +8290 +8298 +8306 +8314 +8322 +8330 +8338 +8346 +8354 +8362 +8370 +8378 +8386 +8394 +8402 +8410 +8418 +8426 +8434 +8442 +8450 +8458 +8466 +8474 +8482 +8490 +8498 +8506 +8514 +8522 +8530 +8538 +8546 +8554 +8562 +8570 +8578 +8586 +8594 +8602 +8610 +8618 +8626 +8634 +8642 +8650 +8658 +8666 +8674 +8682 +8690 +8698 +8706 +8714 +8722 +8730 +8738 +8746 +8754 +8762 +8770 +8778 +8786 +8794 +8802 +8810 +8818 +8826 +8834 +8842 +8850 +8858 +8866 +8874 +8882 +8890 +8898 +8906 +8914 +8922 +8930 +8938 +8946 +8954 +8962 +8970 +8978 +8986 +8994 +9002 +9010 +9018 +9026 +9034 +9042 +9050 +9058 +9066 +9074 +9082 +9090 +9098 +9106 +9114 +9122 +9130 +9138 +9146 +9154 +9162 +9170 +9178 +9186 +9194 +9202 +9210 +9218 +9226 +9234 +9242 +9250 +9258 +9266 +9274 +9282 +9290 +9298 +9306 +9314 +9322 +9330 +9338 +9346 +9354 +9362 +9370 +9378 +9386 +9394 +9402 +9410 +9418 +9426 +9434 +9442 +9450 +9458 +9466 +9474 +9482 +9490 +9498 +9506 +9514 +9522 +9530 +9538 +9546 +9554 +9562 +9570 +9578 +9586 +9594 +9602 +9610 +9618 +9626 +9634 +9642 +9650 +9658 +9666 +9674 +9682 +9690 +9698 +9706 +9714 +9722 +9730 +9738 +9746 +9754 +9762 +9770 +9778 +9786 +9794 +9802 +9810 +9818 +9826 +9834 +9842 +9850 +9858 +9866 +9874 +9882 +9890 +9898 +9906 +9914 +9922 +9930 +9938 +9946 +9954 +9962 +9970 +9978 +9986 +9994 +10002 +10010 +10018 +10026 +10034 +10042 +10050 +10058 +10066 +10074 +10082 +10090 +10098 +10106 +10114 +10122 +10130 +10138 +10146 +10154 +10162 +10170 +10178 +10186 +10194 +10202 +10210 +10218 +10226 +10234 +10242 +10250 +10258 +10266 +10274 +10282 +10290 +10298 +10306 +10314 +10322 +10330 +10338 +10346 +10354 +10362 +10370 +10378 +10386 +10394 +10402 +10410 +10418 +10426 +10434 +10442 +10450 +10458 +10466 +10474 +10482 +10490 +10498 +10506 +10514 +10522 +10530 +10538 +10546 +10554 +10562 +10570 +10578 +10586 +10594 +10602 +10610 +10618 +10626 +10634 +10642 +10650 +10658 +10666 +10674 +10682 +10690 +10698 +10706 +10714 +10722 +10730 +10738 +10746 +10754 +10762 +10770 +10778 +10786 +10794 +10802 +10810 +10818 +10826 +10834 +10842 +10850 +10858 +10866 +10874 +10882 +10890 +10898 +10906 +10914 +10922 +10930 +10938 +10946 +10954 +10962 +10970 +10978 +10986 +10994 +11002 +11010 +11018 +11026 +11034 +11042 +11050 +11058 +11066 +11074 +11082 +11090 +11098 +11106 +11114 +11122 +11130 +11138 +11146 +11154 +11162 +11170 +11178 +11186 +11194 +11202 +11210 +11218 +11226 +11234 +11242 +11250 +11258 +11266 +11274 +11282 +11290 +11298 +11306 +11314 +11322 +11330 +11338 +11346 +11354 +11362 +11370 +11378 +11386 +11394 +11402 +11410 +11418 +11426 +11434 +11442 +11450 +11458 +11466 +11474 +11482 +11490 +11498 +11506 +11514 +11522 +11530 +11538 +11546 +11554 +11562 +11570 +11578 +11586 +11594 +11602 +11610 +11618 +11626 +11634 +11642 +11650 +11658 +11666 +11674 +11682 +11690 +11698 +11706 +11714 +11722 +11730 +11738 +11746 +11754 +11762 +11770 +11778 +11786 +11794 +11802 +11810 +11818 +11826 +11834 +11842 +11850 +11858 +11866 +11874 +11882 +11890 +11898 +11906 +11914 +11922 +11930 +11938 +11946 +11954 +11962 +11970 +11978 +11986 +11994 +12002 +12010 +12018 +12026 +12034 +12042 +12050 +12058 +12066 +12074 +12082 +12090 +12098 +12106 +12114 +12122 +12130 +12138 +12146 +12154 +12162 +12170 +12178 +12186 +12194 +12202 +12210 +12218 +12226 +12234 +12242 +12250 +12258 +12266 +12274 +12282 +12290 +12298 +12306 +12314 +12322 +12330 +12338 +12346 +12354 +12362 +12370 +12378 +12386 +12394 +12402 +12410 +12418 +12426 +12434 +12442 +12450 +12458 +12466 +12474 +12482 +12490 +12498 +12506 +12514 +12522 +12530 +12538 +12546 +12554 +12562 +12570 +12578 +12586 +12594 +12602 +12610 +12618 +12626 +12634 +12642 +12650 +12658 +12666 +12674 +12682 +12690 +12698 +12706 +12714 +12722 +12730 +12738 +12746 +12754 +12762 +12770 +12778 +12786 +12794 +12802 +12810 +12818 +12826 +12834 +12842 +12850 +12858 +12866 +12874 +12882 +12890 +12898 +12906 +12914 +12922 +12930 +12938 +12946 +12954 +12962 +12970 +12978 +12986 +12994 +13002 +13010 +13018 +13026 +13034 +13042 +13050 +13058 +13066 +13074 +13082 +13090 +13098 +13106 +13114 +13122 +13130 +13138 +13146 +13154 +13162 +13170 +13178 +13186 +13194 +13202 +13210 +13218 +13226 +13234 +13242 +13250 +13258 +13266 +13274 +13282 +13290 +13298 +13306 +13314 +13322 +13330 +13338 +13346 +13354 +13362 +13370 +13378 +13386 +13394 +13402 +13410 +13418 +13426 +13434 +13442 +13450 +13458 +13466 +13474 +13482 +13490 +13498 +13506 +13514 +13522 +13530 +13538 +13546 +13554 +13562 +13570 +13578 +13586 +13594 +13602 +13610 +13618 +13626 +13634 +13642 +13650 +13658 +13666 +13674 +13682 +13690 +13698 +13706 +13714 +13722 +13730 +13738 +13746 +13754 +13762 +13770 +13778 +13786 +13794 +13802 +13810 +13818 +13826 +13834 +13842 +13850 +13858 +13866 +13874 +13882 +13890 +13898 +13906 +13914 +13922 +13930 +13938 +13946 +13954 +13962 +13970 +13978 +13986 +13994 +14002 +14010 +14018 +14026 +14034 +14042 +14050 +14058 +14066 +14074 +14082 +14090 +14098 +14106 +14114 +14122 +14130 +14138 +14146 +14154 +14162 +14170 +14178 +14186 +14194 +14202 +14210 +14218 +14226 +14234 +14242 +14250 +14258 +14266 +14274 +14282 +14290 +14298 +14306 +14314 +14322 +14330 +14338 +14346 +14354 +14362 +14370 +14378 +14386 +14394 +14402 +14410 +14418 +14426 +14434 +14442 +14450 +14458 +14466 +14474 +14482 +14490 +14498 +14506 +14514 +14522 +14530 +14538 +14546 +14554 +14562 +14570 +14578 +14586 +14594 +14602 +14610 +14618 +14626 +14634 +14642 +14650 +14658 +14666 +14674 +14682 +14690 +14698 +14706 +14714 +14722 +14730 +14738 +14746 +14754 +14762 +14770 +14778 +14786 +14794 +14802 +14810 +14818 +14826 +14834 +14842 +14850 +14858 +14866 +14874 +14882 +14890 +14898 +14906 +14914 +14922 +14930 +14938 +14946 +14954 +14962 +14970 +14978 +14986 +14994 +15002 +15010 +15018 +15026 +15034 +15042 +15050 +15058 +15066 +15074 +15082 +15090 +15098 +15106 +15114 +15122 +15130 +15138 +15146 +15154 +15162 +15170 +15178 +15186 +15194 +15202 +15210 +15218 +15226 +15234 +15242 +15250 +15258 +15266 +15274 +15282 +15290 +15298 +15306 +15314 +15322 +15330 +15338 +15346 +15354 +15362 +15370 +15378 +15386 +15394 +15402 +15410 +15418 +15426 +15434 +15442 +15450 +15458 +15466 +15474 +15482 +15490 +15498 +15506 +15514 +15522 +15530 +15538 +15546 +15554 +15562 +15570 +15578 +15586 +15594 +15602 +15610 +15618 +15626 +15634 +15642 +15650 +15658 +15666 +15674 +15682 +15690 +15698 +15706 +15714 +15722 +15730 +15738 +15746 +15754 +15762 +15770 +15778 +15786 +15794 +15802 +15810 +15818 +15826 +15834 +15842 +15850 +15858 +15866 +15874 +15882 +15890 +15898 +15906 +15914 +15922 +15930 +15938 +15946 +15954 +15962 +15970 +15978 +15986 +15994 +16002 +16010 +16018 +16026 +16034 +16042 +16050 +16058 +16066 +16074 +16082 +16090 +16098 +16106 +16114 +16122 +16130 +16138 +16146 +16154 +16162 +16170 +16178 +16186 +16194 +16202 +16210 +16218 +16226 +16234 +16242 +16250 +16258 +16266 +16274 +16282 +16290 +16298 +16306 +16314 +16322 +16330 +16338 +16346 +16354 +16362 +16370 +16378 +16386 +16394 +16402 +16410 +16418 +16426 +16434 +16442 +16450 +16458 +16466 +16474 +16482 +16490 +16498 +16506 +16514 +16522 +16530 +16538 +16546 +16554 +16562 +16570 +16578 +16586 +16594 +16602 +16610 +16618 +16626 +16634 +16642 +16650 +16658 +16666 +16674 +16682 +16690 +16698 +16706 +16714 +16722 +16730 +16738 +16746 +16754 +16762 +16770 +16778 +16786 +16794 +16802 +16810 +16818 +16826 +16834 +16842 +16850 +16858 +16866 +16874 +16882 +16890 +16898 +16906 +16914 +16922 +16930 +16938 +16946 +16954 +16962 +16970 +16978 +16986 +16994 +17002 +17010 +17018 +17026 +17034 +17042 +17050 +17058 +17066 +17074 +17082 +17090 +17098 +17106 +17114 +17122 +17130 +17138 +17146 +17154 +17162 +17170 +17178 +17186 +17194 +17202 +17210 +17218 +17226 +17234 +17242 +17250 +17258 +17266 +17274 +17282 +17290 +17298 +17306 +17314 +17322 +17330 +17338 +17346 +17354 +17362 +17370 +17378 +17386 +17394 +17402 +17410 +17418 +17426 +17434 +17442 +17450 +17458 +17466 +17474 +17482 +17490 +17498 +17506 +17514 +17522 +17530 +17538 +17546 +17554 +17562 +17570 +17578 +17586 +17594 +17602 +17610 +17618 +17626 +17634 +17642 +17650 +17658 +17666 +17674 +17682 +17690 +17698 +17706 +17714 +17722 +17730 +17738 +17746 +17754 +17762 +17770 +17778 +17786 +17794 +17802 +17810 +17818 +17826 +17834 +17842 +17850 +17858 +17866 +17874 +17882 +17890 +17898 +17906 +17914 +17922 +17930 +17938 +17946 +17954 +17962 +17970 +17978 +17986 +17994 +18002 +18010 +18018 +18026 +18034 +18042 +18050 +18058 +18066 +18074 +18082 +18090 +18098 +18106 +18114 +18122 +18130 +18138 +18146 +18154 +18162 +18170 +18178 +18186 +18194 +18202 +18210 +18218

1024 1012 1016 1022
12Z 10 MARCH 1965

[illegible]

L 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
 L J021 +024 +028 +030 +031 +036 +037 +034 +027 +017 +020 +016 +019 +017 +009 +013 +019 +020 +040 +032 +019 +009 +007
 L J020 +029 +032 +033 +028 +023 +021 +033 +025 +029 +013 +002 +015 +028 +017 +016 +018 +027 +032 +034 +042 +018 +004
 L J019 +019 +015 +018 +016 +005 +014 +017 +008 +034 +008 +012 +017 +024 +012 +013 +014 +014 +042 +049 +016 +004
 L J018 +012 +014 +020 +020 +017 +020 +028 +016 +007 +011 +019 +029 +023 +014 +017 +013 +020 +056 +047 +007 +012
 L J017 +016 +026 +023 +020 +027 +046 +054 +017 +015 +009 +016 +024 +029 +020 +010 +022 +016 +034 +047 +020 +015 +005
 L J016 +026 +025 +007 +004 +009 +045 +058 +037 +028 +007 +020 +026 +031 +023 +011 +021 +032 +039 +020 +014 +014 +010
 L J015 +019 +004 +014 +015 +017 +015 +039 +038 +020 +025 +019 +018 +025 +025 +032 +032 +031 +021 +008 +012 +016
 L J014 +019 +025
 L J013 +048 +044 +044 +044 +042 +041 +060 +068 +037 +028 +012 +012 +020 +018 +022 +028 +020 +017 +029 +034 +024 +019
 L J012 +053 +046 +049 +051 +040 +041 +008 +017 +040 +041 +043 +040 +024 +014 +006 +068 +011 +021 +036 +026 +006 +004
 L J011 +048 +035 +040 +007 +013 +008 +017 +040 +041 +043 +040 +024 +014 +006 +068 +011 +021 +036 +026 +006 +004
 L J010 +046 +017 +025 +050 +000 +030 +022 +041 +045 +021 +016 +025 +040 +029 +037 +023 +011 +028 +028 +022 +016 +016
 L J009 +071 +053 +071 +062 +055 +036 +029 +027 +044 +026 +050 +040 +046 +044 +018 +038 +031 +021 +026 +024 +028
 L J008 +109 +101 +079 +042 +063 +089 +068 +038 +049 +060 +017 +044 +008 +047 +043 +049 +048 +041 +046 +042 +035 +039
 L J007 +094 +089 +062 +056 +124 +172 +124 +077 +065 +080 +094 +053 +027 +030 +056 +072 +061 +056 +055 +043 +042 +055
 L J006 +085 +068 +061 +073 +133 +073 +147 +085 +083 +084 +092 +123 +088 +050 +083 +086 +060 +051 +044 +045 +058 +071
 L J005 +104 +072 +058 +040 +080 +087 +080 +073 +063 +073 +078 +096 +111 +106 +113 +097 +072 +056 +059 +072 +069 +055
 L J004 +085 +077 +055 +045 +026 +068 +073 +057 +042 +033 +042 +044 +078 +097 +092 +090 +091 +075 +080 +080 +062 +041
 L J003 +051 +075 +074 +066 +043 +018 +025 +032 +049 +035 +027 +024 +031 +059 +069 +059 +070 +077 +065 +057 +069 +076
 L J002 +030 +052 +072 +074 +063 +048 +042 +027 +042 +048 +046 +035 +032 +055 +062 +046 +048 +063 +058 +067 +086 +098
 L J001 +001 +009 +028 +041 +060 +072 +036 +032 +044 +049 +052 +054 +043 +046 +053 +053 +047 +053 +061 +087 +090 +060
 L 1000 +033 +025 +017 +014 +043 +043 +027 +027 +041 +044 +056 +068 +058 +060 +076 +071 +058 +043 +050 +080 +044 +061
 L 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
 VERT GRAD CF VT LAYER 1 PROG. 24 HOURS 00Z 11 MARCH 1965

KINETIC ENERGY

00Z 11 MARCH 1965

LAPLACIAN CF VORTICITY LAYER 2

L 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
 L J021 +131 +89 +92 +093 +079 +094 +091 +066 +041 +127 +030 +044 +042 +116 +001 +007 +018 +049 +055 +022 +015 +028
 L J020 +134 +116 +121 +094 +005 +054 +079 +070 +043 +123 +015 +025 +041 +128 +003 +010 +019 +035 +076 +068 +034 +013
 J019 +009 +001 +002 +076 +052 +036 +054 +051 +035 +026 +019 +028 +052 +040 +010 +008 +013 +037 +076 +082 +039 +035
 J018 +024 +000 +037 +079 +023 +036 +060 +071 +032 +019 +029 +049 +069 +043 +009 +002 +018 +059 +089 +065 +020 +009
 J017 +020 +032 +010 +001 +006 +006 +076 +082 +027 +010 +030 +073 +089 +051 +006 +006 +039 +085 +084 +039 +010 +003
 J016 +016 +009 +005 +013 +018 +001 +053 +061 +036 +016 +032 +065 +084 +037 +016 +021 +012 +116 +047 +012 +007 +003
 J015 +004 +112 +027 +029 +024 +017 +027 +041 +043 +039 +040 +051 +067 +053 +025 +079 +144 +071 +013 +006 +011 +012
 J014 +020 +056 +032 +020 +018 +024 +059 +062 +048 +030 +041 +067 +037 +043 +113 +081 +019 +009 +016 +023 +036
 J013 +090 +096 +070 +044 +039 +030 +061 +080 +048 +028 +012 +019 +045 +044 +000 +017 +005 +014 +028 +037 +069
 J012 +136 +073 +044 +037 +027 +016 +061 +061 +026 +008 +008 +009 +016 +021 +010 +010 +010 +011 +025 +038 +059 +092
 J011 +145 +133 +004 +001 +037 +005 +038 +079 +048 +031 +027 +027 +020 +010 +002 +005 +009 +026 +047 +058 +084 +119
 J010 +213 +062 +038 +079 +084 +069 +144 +164 +097 +057 +053 +019 +002 +005 +013 +057 +092 +110 +150 +190
 J009 +331 +231 +171 +168 +027 +064 +080 +131 +194 +126 +109 +098 +053 +011 +023 +092 +171 +189 +201 +241 +250
 J008 +288 +303 +202 +111 +076 +084 +087 +085 +140 +219 +227 +222 +222 +222 +222 +222 +222 +222 +222 +222 +222
 J007 +155 +193 +142 +073 +073 +074 +055 +082 +154 +232 +312 +399 +417 +352 +406 +433 +295 +194 +182 +198 +152
 J006 +086 +109 +110 +075 +061 +074 +034 +034 +048 +088 +163 +248 +361 +424 +470 +474 +322 +169 +128 +163 +160 +104
 J005 +051 +067 +085 +072 +037 +019 +027 +038 +019 +062 +102 +138 +194 +227 +344 +298 +196 +134 +138 +156 +113 +055
 J004 +026 +055 +050 +057 +040 +021 +035 +044 +049 +061 +067 +072 +081 +127 +156 +139 +125 +127 +124 +092 +047 +021
 J003 +011 +017 +023 +035 +040 +035 +041 +046 +045 +046 +046 +055 +055 +055 +055 +055 +055 +055 +055 +055 +055 +055 +055
 J002 +004 +006 +009 +014 +017 +017 +019 +020 +021 +022 +024 +032 +036 +034 +041 +047 +036 +025 +020 +009 +001 +005

J001 +001 +001 +002 +003 +034 +034 +035 +037 +038 +008 +011 +014 +010 +009 +017 +025 +022 +018 +014 +009 +036 +005
 L J000 +002 +002 +001
 L 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
 KINETIC ENERGY LAYER 2 24 HOURS 00Z 11 MARCH 1965

	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022
LJ021	+407	+615	+408	+393	+406	+488	+417	+434	+425	+193	+153	+114	+050	+996	+999	+027	+089	+215	+340	+437	+522		
LJ020	+504	+705	+499	+513	+561	+105	+596	+534	+473	+421	+266	+225	+163	+173	+990	+973	+991	+027	+147	+320	+436	+484	
	838888888888	111111111111	111111111111	111111111111	111111111111	111111111111	888	777	66666	5555	444	3333333333	44	55	66	7							
J019	+586	+601	+615	+640	+697	+777	+574	+615	+512	+383	+302	+250	+168	+154	+974	+956	+970	+022	+152	+320	+429	+448	
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	888	777	66666	555	44	333333333333	44	55	66	7							
J018	+633	+667	+710	+739	+758	+716	+636	+531	+410	+316	+228	+118	+096	+944	+938	+957	+047	+194	+320	+388	+408		
	1111111111	2222222222	2222222222	2222222222	2222222222	2222222222	111	888	777	666	555	444	33333	444	55	6666							
J017	+686	+725	+767	+776	+766	+763	+716	+611	+498	+397	+300	+200	+067	+934	+868	+878	+968	+116	+253	+325	+351	+368	
	2222222222	2222222222	2222222222	2222222222	2222222222	2222222222	111	888	777	6666	555	44	333	222222	333	44	55	6666666					
J016	+734	+758	+777	+777	+748	+734	+675	+550	+447	+378	+301	+204	+075	+939	+844	+856	+031	+177	+290	+336	+350	+358	
	2222222222	111	888	7777	6666	555	44	33	22222222	33	44	55	6666666										
J015	+745	+747	+745	+734	+727	+701	+604	+478	+409	+367	+315	+241	+128	+026	+964	+965	+064	+199	+287	+330	+352	+370	
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	888	7777	666666	555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555	
J014	+721	+705	+697	+694	+677	+659	+552	+457	+407	+356	+316	+281	+203	+124	+098	+110	+153	+227	+290	+324	+349	+378	
	11111111111111111111	11111111111111111111	11111111111111111111	11111111111111111111	11111111111111111111	11111111111111111111	888	77777	6666666666	5555	4444	5555	4444	5555	4444	5555	4444	5555	4444	5555	4444	5555	
J013	+717	+643	+623	+626	+634	+608	+548	+484	+418	+329	+287	+292	+257	+184	+158	+176	+203	+249	+290	+318	+353	+396	
	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	777	666	5555555555555555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555
J012	+628	+584	+548	+539	+558	+544	+494	+398	+292	+255	+271	+258	+210	+184	+187	+211	+256	+290	+324	+371	+454		
	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	777	666	5555555555555555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555
J011	+595	+541	+504	+497	+522	+541	+534	+476	+371	+297	+277	+274	+272	+243	+204	+195	+217	+263	+306	+342	+419	+523	
	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	777	666	5555555555555555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555
J010	+594	+529	+483	+496	+537	+557	+554	+505	+418	+373	+356	+344	+344	+302	+232	+202	+214	+263	+340	+416	+489	+575	
	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	777	666	5555555555555555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555
J009	+624	+562	+517	+516	+555	+589	+600	+582	+533	+481	+446	+430	+412	+353	+272	+224	+231	+290	+375	+465	+544	+623	
	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	88888888888888888888	7777777777	6666	5555555555555555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555
J008	+670	+618	+580	+564	+576	+614	+646	+653	+625	+576	+530	+491	+454	+398	+331	+297	+308	+355	+425	+506	+590	+670	
	11111111111111111111	11111111111111111111	11111111111111111111	11111111111111111111	11111111111111111111	11111111111111111111	88888888	777777	666666	5555555555555555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555	
J007	+714	+669	+634	+625	+637	+667	+698	+705	+686	+657	+618	+571	+529	+478	+427	+408	+408	+424	+483	+570	+652	+719	
	11111111111111111111	11111111111111111111	11111111111111111111	11111111111111111111	11111111111111111111	11111111111111111111	88888888	777777	666666	5555555555555555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555	
J006	+749	+716	+688	+684	+705	+733	+751	+758	+755	+738	+710	+678	+635	+583	+545	+523	+507	+510	+559	+645	+721	+773	
	11111111111111111111	11111111111111111111	11111111111111111111	11111111111111111111	11111111111111111111	11111111111111111111	88888888	777777	666666	5555555555555555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555	
J005	+776	+755	+739	+737	+753	+776	+796	+820	+817	+809	+790	+765	+726	+687	+659	+634	+617	+622	+658	+718	+777	+817	
	22222222222222222222	22222222222222222222	22222222222222222222	22222222222222222222	22222222222222222222	22222222222222222222	1111111111	888888	777777	666666	5555555555555555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555
J004	+796	+782	+772	+776	+786	+798	+831	+850	+858	+856	+846	+825	+798	+774	+752	+732	+719	+723	+747	+783	+819	+845	
	22222222222222222222	22222222222222222222	22222222222222222222	22222222222222222222	22222222222222222222	22222222222222222222	1111111111	888888	777777	666666	5555555555555555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555
J003	+811	+801	+796	+801	+814	+833	+856	+874	+882	+883	+877	+864	+847	+831	+815	+803	+795	+796	+808	+828	+848	+862	
	22222222222222222222	22222222222222222222	22222222222222222222	22222222222222222222	22222222222222222222	22222222222222222222	1111111111	888888	777777	666666	5555555555555555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555
J002	+820	+615	+813	+819	+831	+845	+869	+884	+893	+895	+891	+881	+866	+853	+848	+845	+841	+841	+846	+855	+862	+866	
	22222222222222222222	22222222222222222222	22222222222222222222	22222222222222222222	22222222222222222222	22222222222222222222	1111111111	888888	777777	666666	5555555555555555	4444	555	4444	555	4444	555	4444	555	4444	555	4444	555
J001	+827	+824	+824	+831	+847	+856	+872	+886	+895	+897	+893	+881	+864	+856	+862	+866	+863	+863	+864	+866	+864	+863	
LJ000	+831	+831	+832	+838	+847	+855	+871	+882	+890	+892	+887	+874	+862	+863	+870	+873	+871	+869	+868	+868	+865	+865	
L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	

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24 HOURS

PRG.

LOWER LEVEL 2 FIELD LAYER 1

L	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
LJ021	-01	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21
LJ020	+02	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	
J019	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	+22	+23	
J018	-08	-09	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	
J017	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	
J016	+02	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	
J015	+00	+01	+02	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	
J014	-01	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	
J013	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	+22	+23	
J012	-01	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	
J011	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	
J010	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	
J009	+01	+02	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	
J008	+02	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	
J007	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	+22	+23	+24	
J006	+01	+02	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	
J005	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	
J004	+01	+02	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	
J003	+02	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	
J002	+00	+01	+02	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	
J001	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	+22	
LJ000	+02	+03	+04	+05	+06	+07	+08	+09	+10	+11	+12	+13	+14	+15	+16	+17	+18	+19	+20	+21	
L	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

LAPLACIAN OF VORTICITY LAYER 1

24 HOURS

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L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
LJ021	+009	+010	+026	+030	+030	+010	+033	+045	+024	+008	+011	+013	+014	+007	+007	+001	+012	+026	+031	+022	+004	+004
LJ020	+021	+014	+022	+029	+015	+007	+010	+032	+033	+008	+009	+002	+013	+007	+001	+012	+026	+031	+022	+004	+004	+004
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J019	+024	+026	+030	+025	+019	+019	+004	+006	+030	+016	+003	+009	+016	+007	+023	+027	+020	+021	+032	+021	+006	+009
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J018	+023	+029	+030	+020	+016	+019	+023	+016	+015	+012	+012	+029	+033	+032	+022	+020	+020	+029	+027	+024	+017	+004
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J017	+030	+028	+020	+011	+014	+019	+030	+023	+003	+004	+018	+031	+033	+024	+013	+013	+027	+035	+028	+017	+015	+010
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J016	+023	+019	+013	+009	+013	+021	+045	+026	+005	+006	+017	+034	+034	+029	+006	+019	+032	+038	+027	+011	+006	+009
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J015	+010	+011	+012	+003	+007	+035	+045	+012	+014	+013	+009	+030	+037	+032	+022	+029	+040	+038	+022	+009	+007	+007
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J014	+037	+038	+032	+030	+028	+040	+026	+008	+014	+022	+033	+030	+029	+035	+044	+044	+032	+018	+010	+004	+004	+004
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J013	+054	+049	+039	+037	+037	+016	+022	+007	+001	+040	+046	+024	+011	+020	+029	+035	+039	+016	+007	+004	+007	+002
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J012	+051	+038	+032	+016	+022	+012	+022	+017	+028	+051	+031	+032	+020	+018	+013	+018	+016	+006	+002	+004	+005	+020
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J011	+048	+024	+013	+020	+023	+008	+027	+009	+027	+009	+025	+045	+030	+024	+010	+027	+033	+022	+007	+013	+019	+032
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J010	+047	+023	+008	+020	+020	+011	+028	+052	+035	+025	+044	+039	+004	+029	+038	+020	+038	+041	+035	+022	+024	+028
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J009	+063	+041	+012	+028	+040	+028	+007	+050	+059	+046	+035	+025	+015	+029	+049	+013	+031	+047	+043	+023	+019	+033
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J008	+082	+072	+046	+015	+037	+037	+009	+038	+061	+044	+007	+021	+035	+033	+039	+053	+041	+020	+029	+047	+029	+047
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J007	+090	+096	+082	+054	+084	+089	+069	+052	+054	+062	+065	+071	+058	+021	+023	+043	+059	+055	+041	+043	+043	+047
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J006	+093	+114	+095	+093	+126	+104	+080	+065	+050	+057	+061	+064	+094	+082	+065	+076	+070	+052	+050	+053	+047	+042
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J005	+079	+102	+105	+094	+084	+048	+037	+071	+064	+059	+047	+055	+094	+115	+108	+104	+084	+063	+064	+062	+049	+044
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J004	+063	+074	+091	+075	+034	+037	+023	+025	+040	+056	+053	+058	+063	+073	+075	+079	+082	+083	+084	+066	+055	+056
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J003	+054	+064	+073	+079	+046	+033	+051	+039	+030	+039	+061	+055	+060	+079	+069	+054	+065	+083	+078	+066	+075	+083
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J002	+036	+055	+063	+070	+082	+077	+067	+035	+041	+048	+081	+100	+132	+152	+110	+073	+082	+080	+068	+080	+112	+110
	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	1111111111	
J001	+014	+030	+041	+045	+084	+093	+058	+035	+044	+074	+117	+150	+162	+134	+123	+089	+099	+105	+108	+118	+105	+079
LJ000	+012	+005	+014	+039	+043	+044	+052	+045	+044	+079	+122	+092	+039	+098	+077	+085	+095	+015	+113	+124	+088	+039
L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021

12Z 11 MARCH 1965

24 HOURS

PROG.

LAYER 1

VERT GRAL CF VT

TIME	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
L																						
LJ021	-115	-058	-029	-102	-196	-072	-036	-139	-149	-054	-033	-034	-012	-13	-021	+006	-037	-124	-070	-026	-069	+003
LJ020	-041	-053	-135	-159	-122	-062	-017	-074	-131	-165	-032	+001	-011	-119	-046	-019	+011	-099	-169	-057	-001	-059
J019	-015	-48	-129	-061	+039	-046	-071	-021	-042	-095	-158	+017	+016	-041	-060	-032	-014	-093	-145	-091	+057	+023
J018	-130	-092	-032	-023	-012	-017	-061	-059	-021	-182	-092	-015	-054	-095	+013	+032	-005	-151	-097	-066	-034	+045
J017	-118	-056	+037	-030	-073	+007	-006	-083	-084	-044	-037	-061	-116	-107	-025	-016	-101	-115	-024	-027	-075	-032
J016	-011	+008	+017	-019	-092	-028	-010	-122	-112	-017	-022	-085	-087	-065	-102	-153	-120	-036	+005	+001	-013	-031
J015	-010	+010	-038	-054	-015	-095	139	-179	-058	+001	-032	-065	-111	-150	-040	-162	-169	-081	-052	-033	-009	+025
J014	-066	-062	-034	-057	+003	-106	-173	-144	+018	+011	-037	+004	-078	-099	-025	-044	-093	-065	-032	-019	+002	-016
J013	-058	-107	-111	-059	-030	-032	-083	+050	+057	+057	+057	+057	+057	+057	+057	+057	+057	+057	+057	+057	+057	-124
J012	-138	-089	-117	-123	-059	+000	-026	+021	-026	-164	-102	+006	-010	-058	-016	-024	-049	-010	-012	-072	-076	-108
J011	-213	-105	+010	-061	-108	-023	-001	-006	-185	-154	-039	-083	-090	-060	-039	-014	-038	+006	-016	-191	-210	-088
J010	-188	-172	-126	-094	-018	-004	-011	-133	-254	-135	-064	-14	+034	-094	-095	-010	-044	-127	-080	-042	-122	-203
J009	-217	-210	-185	-142	+043	+022	-054	100	-134	-143	-176	-31	+008	-007	-089	-119	-188	-184	-135	-033	-030	-217
J008	-211	-227	-087	-078	-238	-172	-036	-043	-109	-160	-136	-154	-150	-193	-183	-140	-089	-109	-190	-212	-186	-186
J007	-140	-223	-251	-102	-189	-257	-097	-059	-171	-194	-180	-217	-210	-267	-034	-175	-095	-190	-214	-194	-203	-201
J006	-146	-174	-285	-248	-124	-095	-109	-141	-119	-145	-232	-191	-199	-288	-323	-287	-259	-340	-373	-222	-130	-132
J005	-138	-130	-128	-230	-62	-025	-080	-095	-080	-083	-222	-135	-227	-272	-266	-324	-336	-329	-341</			

L	1000	1	2	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
LJ021	+888	+888	+888	+888	+888	+888	+888	+888	+888	+888	+888	+888	+888	+888	+888	+888	+888	+888	+888	+888	+888	
LJ020	+903	+903	+903	+903	+903	+903	+903	+903	+903	+903	+903	+903	+903	+903	+903	+903	+903	+903	+903	+903	+903	
	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	8888888888888888	
J019	+915	+916	+916	+921	+926	+927	+927	+927	+927	+927	+927	+927	+927	+927	+927	+927	+927	+927	+927	+927	+927	
J018	+922	+925	+930	+932	+934	+935	+935	+935	+935	+935	+935	+935	+935	+935	+935	+935	+935	+935	+935	+935	+935	
J017	+929	+932	+936	+934	+937	+937	+937	+937	+937	+937	+937	+937	+937	+937	+937	+937	+937	+937	+937	+937	+937	
J016	+935	+938	+937	+932	+934	+926	+926	+926	+926	+926	+926	+926	+926	+926	+926	+926	+926	+926	+926	+926	+926	
J015	+937	+935	+932	+931	+925	+916	+916	+916	+916	+916	+916	+916	+916	+916	+916	+916	+916	+916	+916	+916	+916	
J014	+936	+933	+930	+925	+928	+924	+909	+909	+909	+909	+909	+909	+909	+909	+909	+909	+909	+909	+909	+909	+909	
J013	+931	+925	+920	+919	+912	+917	+908	+908	+908	+908	+908	+908	+908	+908	+908	+908	+908	+908	+908	+908	+908	
J012	+923	+914	+908	+906	+909	+911	+907	+907	+907	+907	+907	+907	+907	+907	+907	+907	+907	+907	+907	+907	+907	
J011	+918	+906	+901	+897	+904	+908	+908	+908	+908	+908	+908	+908	+908	+908	+908	+908	+908	+908	+908	+908	+908	
J010	+920	+906	+893	+905	+911	+912	+905	+905	+905	+905	+905	+905	+905	+905	+905	+905	+905	+905	+905	+905	+905	
J009	+927	+914	+905	+904	+910	+916	+919	+914	+914	+914	+914	+914	+914	+914	+914	+914	+914	+914	+914	+914	+914	
J008	+936	+926	+918	+915	+917	+921	+927	+933	+927	+927	+927	+927	+927	+927	+927	+927	+927	+927	+927	+927	+927	
J007	+944	+936	+929	+927	+929	+932	+932	+932	+932	+932	+932	+932	+932	+932	+932	+932	+932	+932	+932	+932	+932	
J006	+950	+945	+939	+937	+940	+944	+947	+946	+946	+946	+946	+946	+946	+946	+946	+946	+946	+946	+946	+946	+946	
J005	+955	+952	+948	+945	+947	+950	+952	+953	+955	+954	+952	+949	+945	+940	+935	+929	+924	+924	+929	+940	+949	
J004	+959	+957	+954	+952	+953	+954	+957	+954	+951	+960	+959	+951	+954	+951	+947	+944	+941	+940	+944	+950	+956	
J003	+961	+960	+959	+958	+958	+961	+964	+964	+964	+964	+964	+964	+964	+964	+964	+964	+964	+964	+964	+964	+964	
J002	+963	+962	+962	+962	+962	+962	+963	+966	+966	+966	+966	+966	+966	+966	+966	+966	+966	+966	+966	+966	+966	
J001	+964	+964	+963	+964	+964	+965	+967	+967	+968	+968	+968	+968	+968	+968	+968	+968	+968	+968	+968	+968	+968	
LJ000	+964	+964	+964	+965	+966	+966	+967	+968	+969	+969	+969	+969	+969	+969	+969	+969	+969	+969	+969	+969	+969	
L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	
LOWER LEVEL 2 FIELD																						
	12Z 11 MARCH 1965																					

L 1000 1 01 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
 -100 -26 +035 -024 -032 +018 +066 -016 -041 -015 -019 -011 +026 +010 -017 +011 -015 -061 +010 -024 -041 +017
 +045 +024 -019 -028 -070 -013 +055 +024 -026 -012 +026 +004 +005 +006 -032 +008 +036 -021 -026 +025 +019 -032
 J019 +005 -002 -056 +056 +04 -016 -051 +051 +043 -037 -045 +036 +061 +006 -003 -001 +012 -033 -024 +095 +061
 J018 -099 -001 +036 +022 +005 +000 -067 +010 +101 -029 -089 +031 +005 -011 +052 +031 -076 -054 -016 -025 +035 +081
 J017 -097 +019 +008 -070 -112 +066 +076 -018 -033 +003 +026 +022 -034 -067 +004 -020 -037 +009 +060 -003 -062 -027
 J016 +043 +050 -017 -052 -089 +030 +124 -034 -128 +011 +057 +010 -005 -025 -078 -017 +106 +091 -013 -033 -018
 J015 +000 +044 -021 -031 +017 +034 -043 -085 -002 +022 -015 -017 +002 +050 -028 -092 -050 +055 +005 -061 -003 +091
 J014 +000 +017 +023 -001 +046 +066 -085 -080 +100 +053 -032 +031 +008 -034 +023 +000 -012 -014 -019 -001 +011 +004
 J013 -07 -044 +021 +060 +034 -043 +001 +104 +008 -091 +093 +073 -097 -038 +071 -012 -027 +038 +119 +060 -138
 J012 -032 +004 -016 -011 -011 -012 +001 +071 -012 -128 -021 +060 -017 -017 +016 -022 -003 +029 -016 -016 +024
 J011 -102 -036 +072 -044 -107 -012 +052 -045 -094 -147 -016 +007 -078 -012 +007 +073 +068 +058 -034 -186 -092 +129
 J010 +002 -121 -138 -046 -031 +000 -013 -036 -021 -009 -041 -026 +073 +036 -002 +045 -016 -081 -012 +097 +014 -068
 J009 +029 -105 -104 -018 +098 -038 -032 -008 +000 +102 -027 -070 +065 +092 -030 -084 -167 -071 +083 +156 +019 -101
 J008 +034 -013 +098 +001 -115 -138 +022 +076 -003 -010 +062 +006 -047 -064 -098 -050 -032 +087 +067 -047 -089 +002
 J007 +087 +043 -121 -013 -019 -042 +049 +077 -047 -072 -087 +054 +062 -161 -153 +083 +158 -054 -060 +014 -009 -028
 J006 +033 +068 -146 -104 +137 +106 +002 -014 -092 +009 -071 -019 +006 +054 -028 +036 -042 -209 -154 +087 +094 -017
 J005 -042 +068 -015 -121 -032 +105 -016 -062 +023 +039 +026 +007 -007 +051 +076 +017 -034 -072 -067 +028 +041 +013
 J004 -007 +017 +040 -007 -041 -038 -039 -001 +016 -005 +030 +080 -023 -023 +003 +047 +048 +030 +057 +036 -004 -007
 J003 +022 -015 -031 +07 -015 -132 -017 +058 -002 -034 +004 -005 -063 -23 -002 -004 +010 +015 +033 +018 -004 +018
 J002 -006 +003 +014 -005 +003 +033 +020 -014 -028 +008 +008 +011 +028 -000 -017 -004 +007 -001 -034 -047 +009
 J001 +010 +06 -007 -010 +024 +027 +000 -011 -016 +013 +020 +020 +039 +030 +009 -002 -010 +013 +012 -010 -043 -057
 J000 +013 -018 -025 +013 +001 -018 +003 +005 -003 +004 +038 -011 -133 -060 +029 -012 +033 +036 +016 +011 +019 -002
 L 1000 1 01 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
 LAPLACIAN OF VELOCITY LAYER 2 24 HOURS 12Z 11 MARCH 1965

L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
LJ021	+040	+44	+43	+335	+044	+56	+032	+034	+019	+12	+11	+010	+012	+10	+023	+020	+012	+012	+010	+005	+015	+011
LJ020	+017	+37	+046	+033	+035	+026	+032	+035	+029	+10	+007	+012	+006	+20	+028	+020	+014	+014	+015	+016	+019	+009
J019	+007	+10	+029	+077	+012	+053	+048	+033	+032	+025	+013	+010	+012	+16	+006	+020	+016	+10	+013	+019	+021	+006
J018	+001	+03	+012	+010	+007	+010	+027	+040	+034	+028	+011	+009	+14	+026	+021	+016	+022	+022	+026	+020	+011	+014
J017	+004	+02	+009	+016	+004	+011	+009	+030	+041	+031	+010	+011	+021	+023	+017	+015	+021	+024	+022	+019	+011	+019
J016	+003	+03	+008	+018	+014	+002	+025	+052	+039	+021	+009	+018	+030	+015	+002	+012	+017	+014	+015	+004	+026	+023
J015	+010	+05	+009	+012	+009	+022	+054	+062	+023	+005	+005	+004	+025	+043	+024	+010	+017	+020	+022	+012	+025	+011
J014	+014	+02	+019	+007	+024	+069	+047	+022	+013	+007	+004	+038	+025	+037	+022	+018	+020	+015	+008	+016	+006	+006
J013	+021	+036	+049	+040	+002	+037	+043	+030	+023	+008	+014	+012	+009	+026	+023	+033	+039	+016	+027	+002	+002	+002
J012	+048	+063	+063	+057	+042	+022	+007	+010	+008	+022	+012	+008	+012	+017	+021	+035	+042	+031	+017	+038	+017	+038
J011	+049	+054	+053	+045	+044	+013	+017	+024	+067	+013	+006	+022	+012	+014	+006	+013	+019	+018	+016	+034	+058	+058
J010	+072	+064	+045	+011	+045	+008	+021	+042	+060	+040	+023	+010	+018	+014	+016	+003	+011	+023	+028	+036	+046	+044
J009	+080	+087	+084	+069	+063	+031	+033	+054	+002	+071	+074	+063	+036	+012	+017	+008	+021	+032	+038	+040	+034	+036
J008	+066	+075	+093	+107	+062	+033	+046	+037	+020	+040	+062	+073	+080	+065	+024	+035	+030	+021	+032	+034	+033	+040
J007	+046	+055	+055	+055	+058	+042	+038	+010	+013	+017	+019	+029	+063	+101	+086	+048	+022	+005	+037	+046	+044	+042
J006	+036	+037	+036	+016	+001	+000	+011	+000	+034	+001	+030	+030	+031	+064	+094	+059	+035	+027	+044	+070	+065	+046
J005	+031	+032	+042	+037	+012	+009	+005	+038	+044	+028	+048	+047	+026	+035	+067	+068	+050	+052	+067	+078	+067	+040
J004	+023	+025	+034	+049	+042	+018	+038	+054	+020	+008	+011	+030	+019	+024	+049	+068	+067	+069	+080	+072	+052	+030
J003	+011	+021	+026	+038	+046	+048	+054	+008	+012	+016	+018	+029	+021	+006	+020	+045	+062	+067	+062	+049	+028	+016
J002	+002	+003	+018	+026	+032	+035	+020	+007	+019	+011	+010	+027	+020	+026	+008	+021	+037	+038	+055	+012	+030	+048
J001	+005	+002	+004	+011	+016	+012	+007	+015	+017	+014	+023	+038	+031	+031	+030	+021	+011	+005	+003	+034	+038	+033
LJ000	+018	+9	+011	+008	+007	+004	+003	+007	+017	+018	+038	+058	+022	+045	+048	+011	+011	+020	+033	+029	+017	+042
L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
L	VERT	GRA	CF	VT	LAYER	2	PRG.	24	HOURS	12Z	11	MARCH	1965									

L		1000	+001	+097	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
LJ021		+061	+055	+056	+069	+073	+065	+072	+094	+094	+051	+029	+019	+015	+013	+003	+002	+020	+057	+066	+034	+025	+017
LJ020		+121	+092	+087	+111	+114	+108	+064	+085	+107	+064	+028	+021	+020	+021	+006	+001	+014	+042	+074	+062	+024	+005
J019		+068	+071	+085	+083	+088	+042	+024	+043	+093	+078	+024	+013	+027	+033	+011	+001	+015	+043	+073	+078	+039	+003
J018		+033	+041	+045	+015	+006	+012	+023	+035	+072	+076	+033	+021	+045	+038	+011	+001	+013	+065	+074	+053	+034	+010
J017		+033	+029	+006	+000	+093	+000	+035	+080	+068	+037	+037	+051	+068	+038	+006	+003	+052	+103	+056	+014	+013	+009
J016		+016	+003	+004	+003	+001	+009	+070	+101	+037	+015	+033	+059	+074	+052	+013	+018	+100	+102	+026	+004	+005	+005
J015		+000	+005	+012	+004	+002	+008	+085	+051	+017	+017	+028	+045	+058	+048	+036	+047	+089	+069	+019	+009	+013	+011
J014		+014	+034	+034	+018	+014	+042	+056	+019	+013	+028	+023	+031	+053	+031	+023	+050	+052	+040	+024	+015	+011	+014
J013		+065	+060	+064	+051	+030	+031	+027	+020	+058	+034	+032	+006	+021	+022	+014	+011	+016	+017	+015	+025	+058	+127
J012		+120	+094	+050	+050	+039	+011	+011	+041	+076	+034	+024	+017	+033	+034	+014	+005	+019	+016	+030	+082	+158	+191
J011		+178	+086	+027	+008	+011	+004	+008	+057	+093	+057	+024	+017	+033	+034	+014	+005	+019	+016	+030	+082	+158	+191
J010		+286	+140	+023	+024	+039	+000	+072	+069	+145	+174	+110	+068	+071	+060	+028	+003	+008	+061	+133	+172	+166	+183
J009		+334	+265	+136	+094	+059	+064	+057	+100	+100	+190	+089	+140	+099	+090	+060	+033	+062	+157	+198	+150	+141	+195
J008		+277	+293	+186	+122	+094	+097	+106	+101	+112	+134	+178	+210	+202	+178	+141	+158	+169	+149	+155	+155	+185	+217
J007		+190	+255	+170	+122	+158	+164	+111	+078	+114	+128	+149	+201	+300	+359	+332	+278	+179	+111	+186	+256	+243	+191
J006		+117	+195	+190	+128	+134	+121	+071	+059	+094	+133	+153	+172	+230	+367	+421	+343	+255	+219	+315	+346	+235	+144
J005		+069	+116	+163	+125	+082	+055	+041	+042	+068	+090	+117	+124	+139	+204	+285	+329	+355	+383	+386	+291	+166	+093
J004		+040	+060	+090	+102	+065	+041	+046	+050	+043	+044	+057	+070	+080	+103	+148	+209	+277	+318	+275	+167	+089	+050
J003		+020	+031	+000	+061	+058	+045	+047	+033	+024	+023	+028	+040	+051	+063	+081	+107	+141	+158	+124	+071	+040	+024
J002		+008	+014	+021	+028	+036	+038	+026	+014	+012	+014	+016	+021	+028	+034	+044	+055	+067	+069	+072	+031	+018	+011
J001		+09																					

L	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121
LJ021	-191	-105	-104	-130	-176	-191	-176	-144	-143	-176	-059	-030	-001	-113	-042	-010	-046	-130	-066	-016	-081	-010
LJ020	-093	-104	-143	-160	-210	-117	-021	-099	-101	-086	-009	-026	-022	-001	-055	-022	-012	-077	-116	-052	-024	-046
J019	+015	-065	-174	-054	+010	-071	-073	-026	-001	-070	-003	+007	+022	-043	-039	-027	-074	-041	-119	121	+044	+051
J018	-133	-081	-021	-012	+047	+111	-100	-053	-017	-138	129	-001	-019	-069	+014	+007	128	-140	-115	-098	-010	+057
J017	-129	-013	+082	-085	-109	+054	+033	-128	-141	-165	-021	-04	-123	-28	-019	+001	-110	-118	-018	-037	-086	-055
J016	+024	+44	+005	-073	-14	+020	+028	-187	-201	-025	+019	-061	-101	-073	-073	108	-104	-011	+050	-021	-065	-047
J015	-005	+34	-042	-047	+030	-017	-162	-130	-04	+001	-48	-066	-085	-042	-031	-149	-107	-035	-036	-082	-041	+069
J014	-027	-020	-028	-036	+025	+030	-211	-160	+004	+112	-063	-004	-052	-050	-036	-026	-038	-073	-058	-024	-016	-016
J013	-016	-272	-154	-171	+001	-111	-143	-112	-043	+000	-083	+070	+018	-013	-077	+021	-046	-088	-016	+089	+022	-178
J012	-200	-154	-136	-123	-061	-044	-032	+031	-001	-011	+031	-051	-051	-017	-016	-050	-023	-045	-115	-091	-142	-142
J011	-329	-176	-090	-096	-101	-025	+027	-030	-176	-210	-014	-032	-123	-101	-013	+005	+050	+027	-087	-284	-285	-121
J010	-356	-333	-200	-081	-053	+005	-030	-147	-225	-204	-174	-107	-011	-039	-046	+038	-036	-165	-149	-111	-199	-295
J009	-385	-451	-325	-145	-024	-030	-123	-161	-03	-159	-250	-272	-070	-010	-054	-128	-250	-262	-53	-033	-156	-332
J008	-309	-385	-181	-138	-242	-268	-130	-062	-136	-174	-178	-277	-323	-317	-263	-243	-121	-083	-119	-236	-308	-255
J007	-149	-267	-347	-154	-177	-249	-097	-014	-174	-017	-195	-182	-301	-04	-572	-243	-063	-170	-283	-288	-296	-261
J006	-119	-164	-373	-25	-007	-046	-361	-283	-126	-155	-254	-220	-184	-167	-486	-368	-331	-455	-512	-329	-206	-207
J005	-142	-081	-120	-283	-126	+040	-068	-153	-089	-079	-138	-164	-172	-188	-276	-380	-439	-508	-514	-341	-193	-120
J004	-069	-072	-084	-157	-158	-001	-120	-104	-047	-157	-038	-050	-121	-133	-194	-230	-296	-357	-298	-203	-146	-088
J003	-009	-67	-103	-026	117	-199	-083	-007	-037	-073	-042	-074	-135	-002	-099	-158	-194	-211	-154	-104	-071	-022
J002	-016	-016	-037	-040	-073	-073	-022	-002	-045	-053	-022	-041	-037	-031	-052	-033	-107	-100	-084	-076	-095	-050
J001	+003	-005	-019	-031	-007	+001	-015	-031	-037	-006	-010	-027	+001	-111	-039	-048	-042	-021	-014	-061	-092	-095
LJ000	-005	-027	-036	+002	-019	-026	-003	-004	-021	-015	-034	-077	-158	-110	-027	-034	-019	+008	-024	-025	-005	-047
L	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

122 11 MARCH 1965

24 HOURS

P.L.O.

LAYER 2

PRG KAT FIELD

[illegible]

L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
LJ021	+031	-044	-061	-024	-013	-034	-028	+036	+070	-005	-022	-023	+015	+027	-044	-027	+057	-016	-073	-000	-005	+002
LJ020	-005	+007	-016	-036	-017	+021	-019	-003	+075	+038	-046	-076	+034	+057	+004	+017	+003	-037	-098	-012	-003	+058
J019	+010	+022	+007	+029	+023	+019	+013	+001	+002	+002	+005	+037	+006	+004	-021	+009	+010	+016	+019	+010		
J018	+027	-017	-033	+012	+035	+010	-001	+024	+016	-009	+008	+041	+011	-029	+021	+017	-042	+022	+106	+068	-022	-037
J017	+006	-010	+007	+037	+001	+020	+012	+009	+013	-012	-009	+016	-014	-019	-002	-003	-048	-065	+036	+081	-014	-033
J016	+013	-009	+036	+016	-062	-046	+074	+000	-003	-048	-000	+011	-004	+016	-026	-095	-021	+032	+017	+010	-013	-018
J015	+011	+006	-045	-013	-012	+017	+016	+024	+004	-016	+024	+016	+020	-019	-009	+009	+089	+026	-043	-006	+014	
J014	-003	+031	+007	-036	+070	-044	-037	-041	+041	+039	+010	+059	+044	-024	-072	+094	+043	-038	-038	-013	+014	+004
J013	+003	-030	+002	+078	+029	-045	-061	-064	+007	+005	+028	+058	+018	-013	+022	-003	+001	+044	+013	-028	-033	
J012	-032	-052	+011	+011	-046	-004	+028	-032	+015	+012	-084	-042	+030	+061	+067	-056	-050	+059	+071	+017	+000	-003
J011	-050	-011	+011	-034	+010	+074	+028	+015	+078	+066	-076	-06	+046	+071	-058	+078	-087	-143	+053	+116	+007	
J010	-011	-046	-094	-083	+077	+020	-002	+001	+005	+07	-072	-140	+104	+01	-073	+066	-073	-104	-120	-032	+073	+001
J009	-020	-069	-052	-041	-041	-021	+071	-030	-068	+051	-052	-079	+033	-035	-009	+020	-099	+020	+00	-076	-080	+056
J008	-020	-001	+044	-002	-052	-036	-074	-029	+078	+048	+090	-063	-081	-023	+022	-011	+009	+008	-080	-053	+029	
J007	+016	+032	+016	-009	+03	-034	-127	+009	+055	+070	-029	+016	+021	+047	+031	+043	+036	+036	+008	-024	+017	-002
J006	-001	+008	+029	-018	-009	+057	+015	+007	+038	+002	-110	+008	+069	-025	+064	+035	-146	-036	+088	-012	-014	+047
J005	-009	-007	+020	+005	-030	+044	+076	-005	-04	+031	-051	-021	+018	-065	+002	+066	-073	-077	+002	-015	+030	
J004	+008	-013	-006	+020	-015	-043	-037	-049	-009	+032	+029	+005	+008	+032	+001	+029	+064	+001	-037	-018	+003	+007
J003	+000	-003	+001	+002	+004	+074	+001	+026	+030	+004	+004	+022	+003	+015	+024	-032	+021	+051	+005	-026	+035	+012
J002	-001	-001	-000	-011	+012	+028	+017	+017	+001	-018	+003	+011	-002	+001	+015	-023	-031	+018	+028	+015	+006	+014
J001	-004	-009	-002	+005	-006	-004	-011	+001	+004	-031	+009	+012	-027	+006	+009	+027	+028	-036	+025	+025	-085	-007
LJ000	+029	-032	-024	+002	+004	-007	-001	+011	+010	-010	-018	-011	-005	-002	-032	-028	-012	+001	+003	+013	-043	-046
L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021

00Z 12 MARCH 1965

24 HOURS

PRUG.

LAPLACIAN CF VORTICITY LAYER1

LAPLACIAN CF VELOCITY LAYER 1

PKUG.

24 HOURS

00Z 12 MARCH 1965

PRG	KAT	FIELD	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
L			-026	-103	-107	-059	-070	-069	-084	-061	-075	-075	-043	-038	-002	-004	-055	-040	+030	-047	-153	-132	-074	-015
LJ021			-083	-195	-133	-158	-112	-103	-111	-086	-027	-080	-140	-106	+022	+036	-016	+005	-014	-130	-199	-134	-064	+044
LJ020																								
J019			-074	-084	-124	-105	-083	-191	-054	-043	-093	-105	-090	-026	+015	-025	-023	-044	-097	-141	-074	-002	-000	
J018			-046	-100	-125	-061	-037	-014	-019	-014	-076	-093	-042	+005	-039	-184	-020	-003	-086	-123	-036	+020	-029	-041
J017			-051	-166	-044	-025	-020	+004	-006	-051	-085	-088	-052	-039	-086	-078	-026	-013	-134	-238	-086	+056	-021	-039
J016			-021	-034	+028	+036	-102	-100	+018	-048	-125	-088	-040	-057	-094	-037	-037	-132	-160	-229	-061	-005	-016	-024
J015			+006	-006	-050	-067	-072	-095	-184	-092	-083	-076	-015	-035	-010	+003	-061	-004	-048	-059	-010	-028	-064	-083
J014			-042	-034	-060	-101	-021	-072	-184	-097	+015	+028	-012	+019	-023	-211	-119	+023	-029	-106	-087	-037	-002	-019
J013			-086	-124	-066	+023	-049	-184	-092	-083	-076	-015	-035	-010	+003	-061	-004	-048	-059	-010	-028	-064	-083	
J012			-151	-137	-067	+001	-075	-084	-020	-080	-016	-049	-133	-068	+005	+024	+010	-087	-082	+007	-006	-070	-084	-085
J011			-191	-081	-087	-076	-004	+046	-026	-036	+043	-049	-162	-102	-001	-029	-098	+004	+062	-14	-257	-50	-034	-095
J010			-196	-136	-111	-058	+050	+003	-040	-033	-046	-058	-240	-202	+028	-007	-110	+078	+040	-135	-237	-210	-148	-145
J009			-248	-221	-28	-049	-079	-073	+040	-067	-132	-084	-300	-289	-071	-124	-078	-063	-159	-108	-068	-262	-341	-164
J008			-263	-223	-126	-118	-124	-116	-077	-077	-077	-077	-077	-077	-077	-077	-077	-077	-077	-077	-077	-077	-077	-077
J007			-200	-211	-202	-191	-131	-145	-208	-160	-079	-109	-117	-192	-238	-238	-223	-181	-142	-118	-188	-267	-243	-212
J006			-167	-213	-196	-224	-232	-191	-171	-151	-093	-146	-252	-143	-119	-221	-158	-213	-353	-215	-128	-254	-252	-147
J005			-126	-163	-160	-184	-222	-138	-063	-155	-147	-083	-205	-										

L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	
LJ021	+014	-052	-050	-008	-015	-018	-021	-003	+006	-012	-016	-016	+025	+011	-064	+012	+075	-046	-065	+024	+006	+013	
LJC20	-011	-007	-015	-035	-046	-046	-029	+031	+075	+018	-036	-046	+001	+056	+004	-009	-003	-094	-093	-030	-005	+076	
J019	+017	+010	-002	+055	+042	-026	-002	+037	+021	-011	-030	+009	+023	+007	+018	-009	-030	-019	+017	-036	-006	+024	
J018	+028	-015	-046	+018	+050	+013	+018	+036	+002	-024	-005	+044	+022	-045	+003	+046	-027	-019	+099	+102	-013	-047	
J017	-002	-006	-008	-008	-025	-017	+041	+029	+003	-012	-018	+010	+008	-009	-013	-012	-006	-049	-097	+048	+129	-005	-047
J016	+009	-020	+074	+085	-081	-068	+063	+021	-046	-024	-015	-024	+017	+05	-018	-102	-036	+051	+038	-004	-029	-017	
J015	+014	+001	-004	-023	-029	-044	+018	+043	+032	-014	-028	+031	+032	-015	-034	-045	+022	+088	+005	-067	-009	+040	
J014	+023	+045	-025	-049	+077	+053	-057	-021	+036	+033	+027	+077	+037	-134	-090	+098	+069	-055	-067	-047	+021	+013	
J013	+019	-039	-004	+071	+047	-038	-056	-108	-078	+042	-007	+004	+054	-016	-013	+042	-009	+003	+077	+044	-038	-081	
J012	-051	-053	+020	-058	-071	-080	+013	-082	+017	+034	-108	-054	+025	+073	-062	-074	-061	+065	+102	+056	-011	-041	
J011	-017	-016	-005	-047	+003	+084	+033	+034	+118	+159	-083	-064	+053	+114	-075	+029	+098	-121	-189	+069	+145	+022	
J010	+000	-067	-117	-015	+123	+000	-013	+027	+000	+060	-064	-124	+170	-060	-148	+173	+136	-169	-179	+062	+112	-003	
J009	-130	-137	-050	+041	-049	-056	+051	-061	-015	-083	-059	-114	+071	+005	-056	+022	-046	-042	-049	-044	-097	+016	
J008	-028	-024	+073	-023	-136	-016	-014	-087	-029	+087	+085	-003	-113	-103	+007	+005	-036	+013	-003	-100	-077	+019	
J007	+026	+079	+023	-071	+020	+020	-090	+006	+61	+011	+033	+071	+027	+010	+031	+029	+025	+050	-005	-038	+031	-003	
J006	+004	+036	+013	-021	+049	+067	+033	+054	+083	-016	-126	-012	+102	+035	+072	-014	-138	-009	+128	-011	-025	+037	
J005	-011	-012	+035	-010	-048	+059	+068	-101	-023	+000	-056	-063	-029	-072	+044	+077	-122	-109	+049	-007	-037	+050	
J004	+010	-013	+021	-011	-082	+002	+005	-134	-052	+058	+040	+009	+008	-019	-021	+063	+060	-028	-060	-020	-013	+015	
J003	+001	+003	+003	+001	+001	+005	+011	+007	+025	-028	-002	+043	+043	+039	-011	-042	+032	+069	-001	-003	+027	-032	
J002	-006	+004	-008	-001	+032	+012	-002	+044	+078	-032	-021	-009	-012	+014	+026	-054	-050	+031	+045	+028	-013	-016	
J001	+003	-003	+001	-001	-016	-002	-008	-016	-001	-001	-022	+014	+017	-052	-005	+039	+040	+015	-036	+035	+017	-095	+015
LJ000	+011	-011	-007	+003	+002	-004	-003	+011	+007	-007	+004	+006	-012	-002	-008	+007	+013	-045	+006	+020	-082	-023	
L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	
L																							
P																							

LAPLACIAN CF VORTICITY LAYER 2

PRG.

24 HOURS

00Z 12 MARCH 1965

L 1000 1 01 1 02 1 03 1 04 1 05 1 06 1 07 1 08 1 09 1 10 1 11 1 12 1 13 1 14 1 15 1 16 1 17 1 18 1 19 1 20 1 021
+029 +055 +056 +036 +039 +024 +018 +014 +002 +009 +018 +014 +023 +017 +031 +034 +024 +014 +012 +009
+014 +038 +052 +042 +028 +024 +039 +040 +021 +016 +013 +003 +011 +019 +015 +001 +003 +010 +033 +030 +012 +005
J019 +005 +006 +028 +028 +015 +019 +023 +031 +025 +018 +016 +008 +003 +011 +004 +012 +023 +043 +044 +023 +006 +017
J018 +006 +014 +017 +016 +012 +021 +029 +022 +028 +022 +014 +009 +008 +003 +009 +021 +036 +032 +015 +008 +010 +015
J017 +005 +009 +015 +015 +007 +011 +005 +024 +032 +025 +008 +004 +007 +011 +016 +019 +020 +025 +026 +008 +012 +015
J016 +004 +004 +009 +016 +006 +010 +023 +035 +027 +021 +012 +011 +009 +011 +009 +008 +012 +017 +022 +010 +012 +014
J015 +013 +004 +014 +016 +008 +026 +058 +046 +010 +018 +030 +014 +012 +026 +019 +018 +028 +029 +016 +001 +012 +012
J014 +013 +008 +012 +015 +032 +067 +067 +034 +015 +011 +034 +021 +011 +013 +021 +018 +035 +042 +021 +003 +015 +014
J013 +019 +028 +028 +069 +068 +026 +004 +027 +034 +014 +027 +034 +014 +035 +018 +014 +011 +024 +045 +040 +013 +023 +023
J012 +038 +047 +050 +067 +046 +031 +045 +023 +006 +022 +022 +008 +021 +011 +004 +004 +013 +038 +056 +036 +017 +032
J011 +059 +059 +075 +074 +049 +016 +016 +020 +017 +031 +037 +035 +029 +016 +019 +005 +019 +035 +058 +049 +009 +022
J010 +089 +081 +058 +029 +042 +016 +019 +016 +028 +039 +036 +034 +046 +033 +048 +079 +058 +032 +026 +040 +037 +032 +031 +013
J009 +091 +097 +078 +077 +053 +016 +028 +039 +036 +034 +046 +033 +048 +079 +058 +032 +026 +040 +037 +032 +031 +013
J008 +073 +085 +094 +089 +071 +059 +047 +039 +033 +033 +018 +028 +067 +069 +046 +035 +030 +032 +034 +031 +014
J007 +055 +067 +067 +043 +035 +045 +058 +045 +034 +022 +023 +027 +032 +046 +042 +027 +028 +029 +031 +034 +028
J006 +045 +047 +052 +036 +006 +032 +047 +017 +013 +022 +030 +024 +033 +042 +024 +024 +025 +032 +045 +041
J005 +039 +045 +056 +059 +026 +035 +030 +077 +020 +011 +031 +032 +029 +040 +038 +045 +038 +021 +026 +037 +048 +040
J004 +025 +039 +052 +069 +062 +047 +036 +046 +038 +021 +030 +036 +045 +035 +046 +044 +033 +030 +028 +041 +051 +032
J003 +010 +019 +034 +049 +065 +058 +041 +040 +040 +005 +018 +011 +005 +019 +048 +048 +020 +036 +040 +046 +047 +020
J002 +003 +007 +015 +029 +037 +035 +027 +024 +03 +008 +020 +020 +028 +028 +037 +041 +037 +039 +048 +038 +029 +031
J001 +003 +007 +010 +014 +013 +009 +011 +021 +042 +025 +006 +021 +026 +020 +007 +035 +046 +048 +046 +035 +019 +046
LJ000 +017 +005 +004 +004 +004 +001 +002 +014 +035 +039 +021 +019 +012 +013 +018 +025 +041 +052 +038 +038 +053 +056
L 1000 1 001 1 002 1 003 1 004 1 005 1 006 1 007 1 008 1 009 1 010 1 011 1 012 1 013 1 014 1 015 1 016 1 017 1 018 1 019 1 020 1 021
VERT GRADE CF VT LAYER 2 PRG. 24 HOURS 00Z 12 MARCH 1965

L 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
 L021 +032 +031 +033 +037 +031 +032 +052 +080 +089 +060 +024 +010 +011 +011 +001 +007 +018 +032 +068 +094 +049 +010
 L020 +075 +081 +084 +084 +073 +062 +067 +074 +088 +088 +050 +020 +011 +013 +008 +002 +007 +019 +075 +090 +048 +013
 J019 +087 +090 +094 +091 +078 +065 +047 +072 +081 +052 +031 +023 +021 +011 +001 +011 +068 +117 +070 +013 +005
 J018 +058 +063 +063 +040 +020 +018 +018 +038 +072 +066 +042 +036 +045 +034 +010 +001 +030 +123 +129 +037 +003 +001
 J017 +031 +032 +027 +008 +001 +003 +014 +048 +070 +054 +038 +042 +056 +046 +012 +002 +058 +153 +113 +011 +002 +001
 J016 +011 +006 +000 +009 +020 +024 +035 +055 +051 +041 +033 +041 +060 +069 +017 +048 +107 +130 +057 +014 +000 +005
 J015 +001 +003 +015 +029 +034 +039 +063 +057 +035 +026 +024 +042 +079 +061 +014 +058 +099 +066 +028 +013 +010 +014
 J014 +008 +029 +038 +036 +046 +070 +070 +049 +020 +011 +016 +034 +083 +044 +030 +053 +041 +035 +033 +026 +020 +024
 J013 +049 +061 +048 +064 +061 +061 +037 +069 +001 +007 +021 +016 +033 +063 +037 +014 +021 +045 +050 +033 +031 +025
 J012 +108 +065 +049 +040 +024 +017 +026 +026 +023 +039 +026 +002 +010 +037 +026 +007 +007 +056 +111 +086 +072 +104
 J011 +172 +075 +025 +004 +000 +005 +020 +034 +049 +082 +043 +014 +021 +037 +023 +018 +006 +016 +167 +261 +157 +121
 J010 +254 +134 +025 +004 +002 +003 +011 +017 +029 +096 +124 +086 +061 +049 +032 +034 +013 +148 +319 +254 +175
 J009 +300 +228 +128 +54 +020 +023 +029 +031 +056 +16 +204 +156 +076 +093 +115 +085 +080 +111 +165 +228 +297 +270
 J008 +272 +306 +254 +167 +124 +111 +091 +108 +122 +123 +209 +252 +199 +197 +219 +193 +182 +213 +225 +254 +328 +293
 J007 +185 +257 +269 +243 +235 +208 +174 +161 +131 +103 +126 +196 +257 +280 +286 +264 +223 +245 +297 +324 +331 +266
 J006 +102 +151 +197 +212 +195 +185 +160 +104 +085 +095 +098 +110 +159 +199 +243 +280 +236 +231 +276 +283 +273 +224
 J005 +054 +080 +115 +135 +117 +105 +092 +065 +058 +079 +108 +106 +111 +133 +166 +248 +287 +245 +218 +214 +202 +150
 J004 +026 +041 +059 +078 +080 +068 +068 +074 +062 +054 +078 +093 +100 +114 +120 +160 +236 +238 +187 +161 +131 +040
 J003 +010 +018 +026 +039 +050 +046 +050 +063 +049 +033 +036 +044 +051 +071 +084 +091 +120 +148 +138 +105 +069 +040
 J002 +003 +006 +009 +014 +018 +019 +020 +023 +021 +018 +017 +016 +019 +029 +046 +058 +062 +066 +069 +053 +033 +040
 J001 +001 +01 +002 +003 +004 +005 +005 +006 +008 +007 +008 +007 +008 +009 +011 +016 +027 +033 +030 +029 +026 +020 +002
 L000 +003 +002 +001 +001 +001 +000 +000 +001 +001 +002 +002 +003 +003 +006 +005 +008 +015 +018 +016 +016 +016 +016 +016
 L KINETIC ENERGY LAYER 2 24 HOURS 00Z 12 MARCH 1965

L 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
 LJC21 -050 +19 +091 +075 -054 +026 +054 -033 +028 +025 -012 -017 +017 +029 -014 -031 +014 -022 -120 -046 +066 -005
 LJC20 +013 +031 +034 -064 -129 -036 +034 -002 +011 +032 -052 -116 +039 +112 +018 -026 +026 +015 +017 +047 -012 -036
 J019 +025 +05 +046 +023 +036 -045 002 +03 -043 -118 +033 -041 +016 +033 -006 -038 +012 +090 +056 -022 -006
 J018 +039 +002 -03 +054 +103 +039 -020 +024 +020 +031 +055 +005 -047 +018 +028 +018 -039 -051 +020 +033 +005 -006
 J017 +019 +018 +024 +007 -027 +026 +012 -019 +013 +035 +021 -011 +027 +047 -028 -036 004 010 -011 +022 +031 -035
 J016 -003 -013 +005 +011 -031 -015 +032 +010 -016 -022 -026 -019 +051 +018 -074 -139 007 +075 006 -007 +004 -017
 J015 -035 -045 +007 +048 +070 +030 +015 +048 +007 -055 -043 +000 +045 -040 -035 +030 +024 +008 +011 -005 +007
 J014 +019 +029 +053 -023 -021 +053 -013 -04 +024 +010 -032 +032 +026 -104 -056 +055 +060 -006 +003 007 +020 +029
 J013 +008 +04 +015 -104 -129 -040 +015 -033 -074 -177 +035 +097 +074 +016 -022 -015 +002 +067 -013 -088 +036 +067
 J012 +019 +035 +026 +036 -030 -015 +032 +004 -033 -007 +019 +002 +033 +057 -000 -019 +013 +016 -027 -018 +007 -020
 J011 -056 -008 +043 +047 +004 +050 +030 +008 +049 +030 -080 -081 +048 +004 -106 +062 +11 -081 -028 +075 -066 -129
 JC10 -077 -044 +050 007 -018 +013 -023 +007 +058 +044 -023 -087 +017 +012 +037 004 +034 -042 -020 -004 -037 -003
 J009 -056 -070 -054 -036 +017 -024 -030 +021 +009 +023 +033 -020 -074 -014 +009 +056 -097 005 003 -039 +025 +069
 J008 +006 -057 -057 +026 +014 -058 -021 +023 -060 -025 +012 +034 +033 -054 -045 014 +004 -000 +009 +008 -050 -033
 J007 +044 -012 +004 +047 +000 -014 -030 -036 -054 -021 +022 +031 +050 +011 +034 +043 +016 +036 -014 -071 -005
 J006 +009 +008 +022 +008 +023 +051 +031 +057 +036 -031 +026 +043 +021 +017 +036 +001 -038 +038 +041 -026 +007 +047
 J005 +000 -015 -003 -007 +001 -016 +027 +048 +012 -025 -026 +041 +005 -045 001 +031 -025 -034 +008 -011 -021 +017
 J004 +021 -013 -042 +017 +018 -050 -053 -004 +008 -015 017 +018 -016 +019 +026 +041 -020 -037 +022 -016 -058 +006
 J003 +014 -007 -037 +040 +020 -065 -072 +041 +007 -035 +024 +016 -045 +005 +039 -026 -025 +038 +021 +001 +034 +022
 J002 +000 -001 -000 +027 +002 -029 +022 +032 +003 -020 -009 +033 +027 +003 +008 +002 +011 +021 +008 +027 +028 +009
 J001 -003 -015 -006 +006 +005 +003 +000 -001 +002 +003 +007 +021 +009 -042 -022 +042 +011 -030 +025 +020 -085 -059
 LJ000 +037 -052 -018 +007 +009 -002 -010 +006 +002 +008 +022 -040 -059 -022 -008 +002 -009 -029 -010 -027 -039 -005
 L 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
 LAPLACIAN CF VERTICITY LAYER 1

12Z 12 MARCH 1965

24 HOURS

PRG.

L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
LJ021	+010	+009	+020	+040	+021	+013	+020	+005	+014	+025	+017	+011	+012	+017	+020	+013	+016	+009	+020	+039	+019	+010
LJ020	+014	+007	+019	+036	+029	+018	+024	+017	+016	+031	+034	+012	+027	+020	+018	+006	+010	+008	+029	+031	+015	+001
J019	+021	+021	+029	+045	+047	+050	+046	+03	+023	+025	+034	+025	+016	+018	+022	+024	+016	+023	+030	+020	+003	+009
J018	+028	+034	+041	+055	+058	+043	+025	+021	+021	+024	+023	+018	+012	+016	+012	+017	+035	+042	+035	+016	+004	+007
J017	+032	+036	+037	+044	+044	+022	+037	+007	+019	+027	+019	+007	+011	+011	+028	+024	+017	+035	+042	+035	+016	+004
J016	+026	+024	+022	+010	+040	+023	+008	+014	+018	+021	+021	+013	+013	+016	+019	+047	+048	+028	+009	+009	+008	+008
J015	+015	+007	+042	+073	+054	+034	+023	+022	+018	+020	+022	+022	+028	+028	+002	+032	+049	+044	+021	+002	+008	+009
J014	+006	+038	+062	+074	+073	+051	+033	+031	+028	+009	+016	+028	+035	+029	+017	+038	+046	+035	+020	+017	+011	+006
J013	+028	+049	+063	+040	+015	+025	+016	+018	+019	+021	+004	+027	+037	+035	+026	+034	+040	+025	+025	+024	+024	+015
J012	+036	+035	+037	+056	+040	+027	+011	+010	+017	+018	+016	+014	+022	+022	+022	+026	+025	+033	+037	+026	+023	+024
J011	+041	+024	+010	+013	+032	+043	+036	+029	+028	+011	+014	+019	+040	+038	+019	+016	+011	+022	+020	+024	+024	+028
J010	+048	+029	+038	+026	+008	+012	+027	+026	+029	+026	+039	+058	+014	+055	+023	+015	+013	+017	+030	+033	+041	+041
J009	+070	+041	+032	+023	+034	+044	+027	+012	+004	+026	+047	+064	+096	+095	+000	+031	+014	+016	+071	+030	+042	+053
J008	+095	+059	+045	+054	+031	+015	+033	+022	+013	+024	+048	+073	+102	+112	+010	+067	+024	+018	+027	+031	+045	+059
J007	+094	+083	+069	+080	+094	+077	+060	+042	+031	+046	+083	+057	+055	+085	+108	+073	+045	+044	+042	+056	+067	+067
J006	+065	+085	+077	+062	+091	+119	+084	+063	+092	+093	+053	+032	+051	+036	+049	+077	+091	+071	+065	+069	+079	+076
J005	+060	+065	+061	+063	+069	+065	+069	+074	+089	+071	+053	+038	+051	+040	+062	+059	+089	+084	+087	+095	+087	+070
J004	+074	+068	+054	+067	+047	+016	+048	+083	+056	+023	+042	+059	+064	+076	+057	+051	+072	+090	+103	+104	+092	+072
J003	+063	+078	+075	+069	+059	+020	+065	+068	+044	+030	+045	+054	+034	+047	+055	+054	+065	+096	+109	+103	+102	+087
J002	+041	+062	+080	+079	+093	+074	+088	+053	+028	+042	+056	+034	+014	+033	+069	+074	+102	+134	+115	+095	+096	+099
J001	+026	+034	+046	+054	+087	+117	+093	+036	+023	+038	+062	+075	+050	+057	+062	+089	+125	+126	+111	+091	+074	+060
LJ000	+006	+012	+025	+026	+044	+072	+055	+043	+040	+043	+068	+031	+049	+028	+046	+077	+084	+061	+068	+080	+053	+068
L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
M	VERT	GRAD	CF	VT	LAYER	1	PRG5.	24	HOURS	12Z	12	MARCH	1965									

L 1009 1 001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
 LJC21 +042 +042 +045 +032 +076 +028 +027 +031 +034 +018 +004 +001 +011 +012 +003 +009 +030 +081 +099 +035 +011
 LJC20 +049 +036 +031 +066 +077 +056 +049 +050 +048 +061 +052 +009 +002 +011 +004 +018 +060 +096 +048 +006 +007
 J019 +037 +032 +036 +079 +116 +086 +054 +054 +063 +075 +084 +042 +005 +001 +004 +000 +024 +077 +068 +013 +000 +004
 J018 +028 +027 +032 +034 +041 +045 +035 +031 +044 +060 +075 +069 +022 +008 +008 +002 +031 +080 +059 +008 +002 +004
 J017 +016 +013 +009 +002 +001 +006 +013 +019 +028 +041 +053 +041 +030 +031 +017 +008 +060 +079 +044 +008 +001 +003
 J016 +006 +004 +003 +004 +008 +012 +020 +030 +040 +050 +042 +027 +032 +050 +015 +024 +097 +068 +024 +007 +000 +005
 J015 +003 +000 +009 +037 +051 +066 +051 +047 +042 +043 +031 +026 +039 +040 +012 +055 +074 +036 +018 +014 +007 +013
 J014 +001 +007 +045 +091 +097 +073 +083 +042 +029 +015 +011 +027 +062 +048 +018 +040 +028 +013 +020 +033 +033 +030
 J013 +006 +042 +096 +084 +049 +025 +013 +011 +005 +001 +001 +047 +058 +017 +011 +011 +010 +018 +040 +075 +076
 J012 +033 +063 +074 +045 +000 +000 +001 +006 +011 +007 +005 +008 +017 +035 +014 +005 +001 +006 +009 +028 +071 +116
 J011 +058 +027 +086 +027 +010 +003 +002 +007 +019 +030 +023 +006 +008 +026 +016 +008 +003 +001 +008 +028 +059 +138
 J010 +084 +038 +021 +017 +013 +005 +004 +004 +004 +004 +004 +004 +004 +004 +004 +004 +004 +004 +004 +004 +004 +210
 J009 +120 +069 +032 +035 +038 +025 +018 +013 +011 +011 +011 +011 +011 +011 +011 +011 +011 +011 +011 +011 +22
 J008 +138 +115 +091 +091 +090 +081 +081 +081 +081 +081 +081 +081 +081 +081 +081 +081 +081 +081 +081 +081 +22222222
 J007 +108 +122 +115 +109 +117 +133 +133 +133 +133 +133 +133 +133 +133 +133 +133 +133 +133 +133 +133 +133 +206
 J006 +064 +077 +078 +077 +086 +102 +102 +102 +102 +102 +102 +102 +102 +102 +102 +102 +102 +102 +102 +102 +22222222
 J005 +038 +044 +044 +047 +048 +046 +055 +067 +074 +073 +063 +058 +071 +064 +100 +115 +117 +112 +118 +123 +119 +096
 J004 +022 +028 +029 +032 +030 +026 +033 +037 +040 +043 +039 +035 +064 +058 +064 +070 +084 +093 +091 +089 +080 +058
 J003 +012 +017 +020 +021 +021 +024 +031 +027 +023 +022 +018 +018 +024 +028 +030 +037 +050 +055 +052 +049 +040 +025
 J002 +005 +008 +011 +011 +013 +015 +020 +013 +010 +009 +006 +005 +008 +008 +009 +016 +021 +019 +018 +015 +009 +007
 J001 +002 +003 +005 +005 +006 +006 +008 +005 +003 +002 +001 +001 +001 +001 +001 +001 +001 +001 +001 +001 +003 +004
 LJ000 +001 +001 +002 +002 +002 +003 +003 +002 +001 +000 +001 +002 +003 +001 +001 +001 +001 +001 +001 +001 +002 +004 +004
 L 1009 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
 KINETIC ENERGY LAYER 1 24 HOURS 12Z 12 MARCH 1965

L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
LJ021	-102	-032	+044	-080	-107	-014	-044	-066	-018	-033	-047	-026	+003	-001	-046	-047	+001	-061	-221	-185	+012	-026
LJ020	-040	-112	-025	-166	-235	-109	-039	-068	-053	-060	-139	-137	-020	+090	-010	-037	-002	-053	-109	-031	-032	-044
	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	
	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	
J019	-033	-048	+112	-099	-127	-185	-098	-055	-129	-118	-105	-106	-061	-003	+007	-030	-077	-088	-009	+022	-025	-018
	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	
J018	-046	-055	-108	-035	+034	-082	-080	-027	-045	-053	-043	-073	-075	-032	-013	-008	-087	-160	-074	+005	+001	-017
	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	
J017	-029	-031	-023	-053	-073	-002	-060	-045	-034	-035	-051	-059	-014	-011	-069	-005	-090	-031	-091	-002	+026	-044
	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	
J016	-034	-042	-020	-003	-079	-050	+005	-034	-074	-093	-089	-051	+002	-011	-105	-182	-187	-042	-046	-023	-004	-030
	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	
J015	-052	-057	-062	-035	-054	-087	-054	-011	-056	-108	-091	-067	-063	-054	-128	-093	-056	-031	-004	-019	-014	
	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	
J014	+012	-016	-005	-194	-191	-070	-099	-118	-034	-015	-061	-021	-070	-182	-091	+017	-014	-054	-036	-057	-023	-008
	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	88888888	
J013	+034	-009	-144	-228	-187	-090	-014	-068	-099	-050	+030	+06										

L	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
LJ021	-058	-035	+055	-046	-041	+037	-005	-050	+049	+076	-001	-022	-015	-011	-002	-013	-048	-096	-047	+062	+002
LJ020	+024	+050	-033	-076	-107	-026	+005	+011	+054	+010	-064	-04	+031	+67	+005	-041	+026	+053	+042	-028	-044
JC19	+026	+004	-010	-033	-035	-037	-002	+020	-031	-077	-062	-033	-012	+022	-025	-047	+041	+106	+030	-036	+008
J018	-012	+006	+051	+050	+020	-002	-002	+016	+065	+046	-035	-035	+038	+032	+027	-056	-080	+014	+046	+018	-024
J017	+011	+026	+029	-029	-040	+033	+008	-021	+026	+075	+052	+019	+014	-017	-000	+070	-033	-034	+055	+047	-047
J016	-033	-016	+033	-021	-021	+022	+028	-002	-002	-058	-056	+017	+051	+33	-066	-121	+015	+070	-001	-011	-000
J015	-038	-055	+003	+053	+015	+057	+001	+025	+045	-015	-076	-053	+038	+020	-052	-015	+034	+028	-002	-002	-014
J014	+022	+016	+052	-017	-023	+055	-006	-052	-008	+038	-009	+011	+021	-065	-039	+091	+067	+019	+022	-017	+031
J013	+076	+056	+015	-047	-035	-041	+025	-054	-088	-016	+061	+104	+066	-012	-002	-014	-042	+053	-004	-088	+105
J012	+031	+017	-045	-012	-035	-055	+039	+054	-044	-011	-074	+003	+043	+014	-028	-029	-006	-026	-031	+028	-018
J011	-052	-031	+046	+027	+012	+045	-006	+019	+094	+035	-133	-092	+051	+13	-145	+079	+169	-058	+005	+103	-107
J010	-091	-070	+065	-013	-011	+028	-066	+021	+114	+035	-022	-067	+034	+105	-047	-042	-070	-018	-004	-034	-051
J009	-057	-111	-039	-013	-040	-035	+002	-027	-064	+018	+027	-036	-062	+029	+089	-078	-156	-032	-025	-060	+031
J008	+035	-095	-086	+069	+088	-064	+016	-060	-118	-008	+021	+004	-020	-075	-000	+032	+062	+005	-018	-000	-076
J007	+065	-206	-033	+056	+061	-014	-054	-070	+054	-038	+037	+047	+075	+035	-093	+015	+113	+079	+040	-046	-107
J006	+001	+037	+053	+001	+026	+067	+031	+069	+068	-024	-021	+044	+044	+044	+044	-003	-080	+037	+051	-043	+011
J005	-005	-006	-011	-025	-010	+056	+059	-067	-009	-027	-025	+019	+018	+003	-051	+046	+081	-023	-055	+015	-024
J004	+041	-030	-057	+003	+030	-074	-064	-015	-029	+007	+045	+032	+032	+004	-022	-012	+034	+009	-039	+026	-006
J003	+079	+001	-063	+059	+026	-115	-073	+082	-024	-053	-015	+03	-031	-063	-007	-024	-049	+023	+020	+013	+055
J002	-009	+12	+021	+031	+059	-014	+026	+041	+015	-050	-03	+042	+042	+011	+038	+015	+026	+044	+043	+043	-004
J001	+004	-008	-004	-003	+004	+022	-002	-002	-010	-000	+029	+023	+031	+036	-010	+017	+006	+016	+038	-033	-124
LJ000	+007	-028	-006	+005	+005	-004	-003	+001	+001	+027	+035	-051	-071	-07	-029	-033	+001	-036	-001	-091	-000
L	1006	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020
L	1021	1020	1019	1018	1017	1016	1015	1014	1013	1012	1011	1010	1009	1008	1007	1006	1005	1004	1003	1002	1001
L	1000	999	998	997	996	995	994	993	992	991	990	989	988	987	986	985	984	983	982	981	980
L	979	978	977	976	975	974	973	972	971	970	969	968	967	966	965	964	963	962	961	960	959
L	958	957	956	955	954	953	952	951	950	949	948	947	946	945	944	943	942	941	940	939	938
L	937	936	935	934	933	932	931	930	929	928	927	926	925	924	923	922	921	920	919	918	917
L	916	915	914	913	912	911	910	909	908	907	906	905	904	903	902	901	900	899	898	897	896
L	895	894	893	892	891	890	889	888	887	886	885	884	883	882	881	880	879	878	877	876	875
L	874	873	872	871	870	869	868	867	866	865	864	863	862	861	860	859	858	857	856	855	854
L	853	852	851	850	849	848	847	846	845	844	843	842	841	840	839	838	837	836	835	834	833
L	832	831	830	829	828	827	826	825	824	823	822	821	820	819	818	817	816	815	814	813	812
L	811	810	809	808	807	806	805	804	803	802	801	800	799	798	797	796	795	794	793	792	791
L	790	789	788	787	786	785	784	783	782	781	780	779	778	777	776	775	774	773	772	771	770
L	769	768	767	766	765	764	763	762	761	760	759	758	757	756	755	754	753	752	751	750	749
L	748	747	746	745	744	743	742	741	740	739	738	737	736	735	734	733	732	731	730	729	728
L	727	726	725	724	723	722	721	720	719	718	717	716	715	714	713	712	711	710	709	708	707
L	706	705	704	703	702	701	700	699	698	697	696	695	694	693	692	691	690	689	688	687	686
L	685	684	683	682	681	680	679	678	677	676	675	674	673	672	671	670	669	668	667	666	665
L	664	663	662	661	660	659	658	657	656	655	654	653	652	651	650	649	648	647	646	645	644
L	643	642	641	640	639	638	637	636	635	634	633	632	631	630	629	628	627	626	625	624	623
L	622	621	620	619	618	617	616	615	614	613	612	611	610	609	608	607	606	605	604	603	602
L	601	600	599	598	597	596	595	594	593	592	591	590	589	588	587	586	585	584	583	582	581
L	580	579	578	577	576	575	574	573	572	571	570	569	568	567	566	565	564	563	562	561	560
L	559	558	557	556	555	554	553	552	551	550	549	548	547	546	545	544	543	542	541	540	539
L	538	537	536	535	534	533	532	531	530	529	528	527	526	525	524	523	522	521	520	519	518
L	517	516	515	514	513	512	511	510	509	508	507	506	505	504	503	502	501	500	499	498	497
L	496	495	494	493	492	491	490	489	488	487	486	485	484	483	482	481	480	479	478	477	476
L	475	474	473	472	471	470	469	468	467	466	465	464	463	462	461	460	459	458	457	456	455
L	454	453	452	451	450	449	448	447	446	445	444	443	442	441	440	439	438	437	436	435	434
L	433	432	431	430	429	428	427	426	425	424	423	422	421	420	419	418	417	416	415	414	413
L	412	411	410	409	408	407	406	405	404	403	402	401	400	399	398	397	396	395	394	393	392
L	391	390	389	388	387	386	385	384	383	382	381	380	379	378	377	376	375	374	373	372	371
L	370	369	368	367	366	365	364	363	362	361	360	359	358	357	356	355	354	353	352	351	350
L	349	348	347	346	345	344	343	342	341	340	339	338	337	336	335	334	333	332	331	330	329
L	328	327	326	325	324	323	322	321	320	319	318	317	316	315	314	313	312	311	310	309	308
L	307	306	305	304	303	302	301	300	299	298	297	296	295	294	293	292	291	290	289	288	287
L	286	285	284	283	282	281	280	279	278	277	276	275	274	273	272	271	270	269	268	267	266
L	265	264	263	262	261	260	259	258	257	256	255	254	253	252	251	250	249	248	247	246	245
L	244	243	242	241	240	239	238	237	236	235	234	233	232	231	230	229	228	227	226	225	224
L	223	222	221	220	219	218	217	216	215	214	213	212	211	210	209	208	207	206	205	204	203
L	202	201	200	199	198	197	196	195	194	193	192	191	190	189	188	187	186	185	184	183	182
L	181	180	179	178	177	176	175	174	173	172	171	170	169	168	167	166	165	164	163	162	161
L	160	159	158	157	156	155	154	153	152	151	150	149	148	147	146	145	144	143	142	141	140
L	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121	120	119
L	118	117	116	115	114	113	112	111	110	109	108	107	106	105	104	103	102	101	100	99	98
L	97	96	95	94	93	92	91	9													

L 1000 1 1 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021
 +005 +006 +032 +062 +085 +021 +028 +018 +019 +029 +026 +001 +008 +012 +022 +015 +015 +026 +014 +009 +016 +023
 L 1020 +007 +005 +024 +043 +053 +040 +038 +041 +021 +022 +012 +021 +017 +018 +015 +007 +020 +019 +009 +009 +016
 J019 +006 +016 +018 +021 +006 +029 +025 +042 +037 +015 +009 +013 +016 +008 +019 +018 +017 +015 +001 +012 +012
 J018 +007 +017 +007 +019 +024 +016 +018 +031 +023 +021 +013 +004 +011 +013 +014 +014 +014 +005 +007 +010
 J017 +008 +017 +012 +005 +007 +013 +011 +014 +023 +030 +028 +013 +011 +013 +012 +015 +016 +012 +011 +008 +009 +011
 J016 +012 +004 +006 +006 +011 +007 +027 +038 +023 +025 +038 +012 +017 +019 +018 +022 +014 +010 +016 +015 +016 +019
 J015 +009 +008 +002 +003 +007 +038 +056 +043 +026 +026 +029 +016 +021 +026 +023 +009 +006 +012 +020 +011 +014 +024
 J014 +022 +014 +014 +029 +040 +057 +060 +028 +017 +013 +017 +012 +012 +029 +035 +030 +025 +029 +025 +007 +015
 J013 +018 +013 +036 +048 +046 +044 +022 +017 +023 +016 +010 +024 +021 +018 +025 +035 +035 +035 +037 +041 +029 +010
 J012 +023 +039 +048 +053 +037 +009 +037 +032 +015 +027 +021 +021 +021 +012 +017 +033 +037 +041 +035 +025
 J011 +040 +041 +055 +057 +035 +047 +029 +014 +020 +027 +039 +024 +038 +018 +018 +019 +043 +037 +022 +029
 J010 +071 +057 +055 +042 +022 +032 +060 +018 +004 +015 +028 +042 +057 +049 +071 +023 +010 +018 +048 +035 +011 +023
 J009 +081 +074 +052 +057 +081 +071 +035 +041 +016 +005 +018 +034 +020 +037 +050 +064 +027 +044 +049 +032 +017 +025
 J008 +068 +076 +071 +068 +089 +089 +0123 +097 +045 +034 +039 +048 +045 +032 +044 +018 +043 +063 +056 +041 +031 +030 +041
 J007 +056 +065 +063 +050 +054 +067 +069 +077 +060 +047 +054 +057 +049 +048 +038 +024 +041 +044 +035 +037 +044 +047
 J006 +048 +051 +050 +041 +024 +043 +037 +055 +043 +019 +029 +041 +024 +044 +038 +018 +018 +029 +037 +041 +040
 J005 +033 +042 +039 +034 +020 +016 +008 +009 +006 +017 +049 +005 +027 +028 +043 +023 +010 +033 +033 +037 +040
 J004 +020 +032 +035 +033 +030 +026 +011 +013 +027 +023 +038 +021 +020 +019 +027 +036 +034 +046 +042 +033 +042 +040
 J003 +013 +025 +033 +035 +038 +042 +044 +034 +043 +045 +043 +038 +047 +031 +015 +034 +046 +051 +037 +031 +030 +027
 J002 +007 +015 +025 +027 +032 +044 +043 +030 +045 +054 +027 +024 +056 +014 +008 +029 +040 +017 +010 +006 +027 +047
 J001 +008 +013 +012 +015 +018 +022 +019 +011 +023 +031 +012 +003 +024 +039 +010 +024 +017 +008 +010 +027 +015 +046
 L 1000 +015 +013 +003 +006 +008 +009 +038 +006 +005 +012 +020 +017 +021 +024 +031 +016 +019 +020 +011 +013 +039 +058
 L 1000 1 001 1 002 1 003 1 004 1 005 1 006 1 007 1 008 1 009 1 010 1 011 1 012 1 013 1 014 1 015 1 016 1 017 1 018 1 019 1 020 1 021

12Z 12 MARCH 1965

24 HOURS

PRG.

LAYER 2

VERT GRAU CF VT

L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
LJ021	-125	-075	-024	-103	-116	-126	-072	-114	-003	-034	-013	-003	-033	-040	-014	-042	-126	-206	-146	+012	-034	
LJ020	-058	-137	100	-224	-245	-131	777777	777777	777777	777777	777777	777777	777777	777777	777777	777777	777777	777777	777777	777777	777777	
J019	-039	-075	117	000	-129	-156	-090	-067	-142	-189	-148	-080	-031	+010	+015	-044	-102	-072	+027	+019	-049	-008
J018	-060	-077	-053	-012	+031	-051	-057	-056	-068	-151	-076	-112	-062	-014	+012	+013	-100	-180	-072	+032	+008	-038
J017	-019	-003	+003	-038	-040	+014	-016	-061	-026	-010	-043	-054	-032	-031	-040	-020	-060	-126	-082	+035	+037	-063
J016	-023	-026	+007	+021	-041	-046	-022	-039	-080	-152	-135	-023	-005	-037	-097	-164	-096	-007	-044	-041	-017	-029
J015	-051	-064	-007	+012	-029	-076	-102	-071	-036	-099	-130	-094	-051	-049	-090	-113	-045	-020	-036	-024	-037	-055
J014	-004	-003	+002	-131	-150	-072	-110	-129	-041	-007	-035	-039	-047	-118	-086	+022	+009	-021	-021	-068	-012	-016
J013	+049	+003	-117	-186	-196	-125	-016	-164	-078	-034	+049	+066	-003	-081	-034	-056	-081	+004	-057	-166	-070	-008
J012	-044	-102	-171	-117	-009	-064	+002	-024	-075	-049	-045	-020	-035	-054	-049	-028	-062	-079	-038	-129	-266	
J011	-208	-149	-047	-064	-039	-007	-017	-002	+049	-030	-175	-129	-005	-111	-193	+051	+156	-080	-048	+048	-189	-390
J010	-348	-211	-029	-092	-062	-022	-038	-027	+098	-030	-132	-173	-071	-029	-214	-106	-011	-048	-082	-135	-242	-284
J009	-393	-334	-169	-161	-214	-176	-070	-104	-045	-043	-113	-223	-207	-097	-127	-306	-340	-240	-228	-272	-272	-290
J008	-297	-415	-333	-190	-219	-364	-227	-235	-266	-166	-193	-224	-291	-314	-274	-292	-340	-385	-355	-296	-411	-463
J007	-175	-301	-306	-181	-174	-312	-357	-258	-263	-259	-189	-211	-213	-273	-406	-325	-215	-275	-318	-386	-494	-388
J006	-148	-147	-131	-159	-170	-038	-165	-145	-116	-196	-190	-215	-210	-262	-271	-275	-182	-214	-352	-321	-206	-206
J005	-097	-116	-093	-123	-094	-009	-030	-138	-134	-061	-044	-075	-119	-177	-114	-105	-194	-219	-185	-213	-240	-167
J004	-014	-110	-178	-076	-045	-136	-122	-061	-118	-068	-044	-040	-070	-107	-108	-070	-116	-185	-130	-157	-226	-121
J003	-002	-050	-136	-016	-062	-205	-119	-000	-058	-120	-081	-034	-114	-145	-069	-105	-150	-092	-078	-075	-025	-049
J002	-023	-017	-026	-017	-052	-094	-050	-011	-049	-130	-078	+007	-063	-073	+002	-046	-087	-017	+014	+023	-018	-071
J001	-005	-015	-015	-032	-026	-015	-033	-023	-040	-045	+011	+016	+004	-010	-020	-019	-034	-001	+022	-066	-150	-107
LJ000	+002	-041	-012	-002	-007	-016	-014	-006	-075	+014	+014	-069	-091	-032	-064	-055	-026	-066	-121	-116	-056	-041
L	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021
M	PRG	KAT	FIELD	LAYER 2	PRG	24 HOURS	12Z	12	MARCH	1965												

TABLE 1

AIRCRAFT TURBULENCE CRITERIA

<u>CATEGORY</u>	<u>DEFINITION</u>
LIGHT	A turbulent condition during which occupants may be required to use seat belts, but objects in the aircraft remain at rest.
MODERATE	A turbulent condition in which occupants require seat belts and occasionally are thrown against the belt. Unsecured objects in aircraft move about.
SEVERE	A turbulent condition in which the aircraft momentarily may be out of control. Occupants are thrown violently against the belt and back into the seat. Objects not secured in the aircraft are tossed about.
EXTREME	A rarely encountered turbulent condition in which the aircraft is violently tossed about, and is practically impossible to control. May cause structural damage to the aircraft.

FIELDS	DATE	TIME	LAYER	TOTAL # OF OCCR	%	L to M		M		M to S		S	
						OCCR	#	OCCR	#	OCCR	#	OCCR	#
LAPLACIAN OF VORTICITY	10 MAR 65	00Z	I	19	79	11	7	6	5	2	1	0	0
VERTICAL GRADIENT OF THERMAL WIND	"	"	"	"	63	11	8	6	4	2	0	0	0
KINETIC ENERGY	"	"	"	"	26	11	3	6	2	2	0	0	0
KAT FIELD	"	"	"	"	32	11	5	6	1	2	0	0	0
LAPLACIAN OF VORTICITY	10 MAR 65	"	II	42	67	22	16	16	8	4	4	0	0
VERTICAL GRADIENT OF THERMAL WIND	"	"	"	"	90	22	22	16	12	4	4	0	0
KINETIC ENERGY	"	"	"	"	86	22	19	16	13	4	4	0	0
KAT FIELD	"	"	"	"	76	22	17	16	12	4	3	0	0
LAPLACIAN OF VORTICITY	10 MAR 65	12Z	I	14	71	6	5	5	5	3	0	0	0
VERTICAL GRADIENT OF THERMAL WIND	"	"	"	"	57	6	3	5	2	3	3	0	0
KINETIC ENERGY	"	"	"	"	93	6	6	5	5	3	2	0	0
KAT FIELD	"	"	"	"	71	6	6	5	4	3	0	0	0
LAPLACIAN OF VORTICITY	10 MAR 65	"	II	21	71	15	9	6	6	0	0	0	0
VERTICAL GRADIENT OF THERMAL WIND	"	"	"	"	90	15	13	6	6	0	0	0	0
KINETIC ENERGY	"	"	"	"	90	15	13	6	6	0	0	0	0
KAT FIELD	"	"	"	"	90	15	13	6	6	0	0	0	0

TABLE 2

FIELDS	DATE	TIME	LAYER	TOTAL # OF OCCR	% CORR	L to M		M		M to S		S	
						# OCCR	# CORR	# OCCR	# CORR	# OCCR	# CORR	# OCCR	# CORR
LAPLACIAN OF VORTICITY	11 MAR 65	00Z	I	40	68	21	10	13	11	5	5	1	1
VERTICAL GRADIENT OF THERMAL WIND	"	"	"	"	100	21	21	13	13	5	5	1	1
KINETIC ENERGY	"	"	"	"	67	21	15	13	8	5	4	1	0
KAT FIELD	"	"	"	"	63	21	9	13	9	5	5	1	1
LAPLACIAN OF VORTICITY	11 MAR 65	00Z	II	51	71	31	21	16	11	4	4	0	0
VERTICAL GRADIENT OF THERMAL WIND	"	"	"	"	98	31	30	16	16	4	4	0	0
KINETIC ENERGY	"	"	"	"	88	31	29	16	12	4	4	0	0
KAT FIELD	"	"	"	"	82	31	25	16	13	4	4	0	0
LAPLACIAN OF VORTICITY	11 MAR 65	12Z	I	22	77	14	9	6	6	1	1	1	1
VERTICAL GRADIENT OF THERMAL WIND	"	"	"	"	86	14	11	6	6	1	1	1	1
KINETIC ENERGY	"	"	"	"	64	14	10	6	4	1	0	1	0
KAT FIELD	"	"	"	"	50	14	8	6	5	1	0	1	0
LAPLACIAN OF VORTICITY	11 MAR 65	12Z	II	5	60	3	3	2	0	0	0	0	0
VERTICAL GRADIENT OF THERMAL WIND	"	"	"	"	80	3	2	2	0	0	0	0	0
KINETIC ENERGY	"	"	"	"	60	3	2	2	1		0	0	0
KAT FIELD	"	"	"	"	40	3	1	2	1	0			

TABLE 3

FIELDS	DATE	TIME	LAYER	TOTAL # OF OCCR	%	L to M		M		N to S		S	
						OCCR	% CORR	OCCR	% CORR	OCCR	% CORR	OCCR	% CORR
LAPLACIAN OF VORTICITY	12 MAR 65	00Z	I	27	52	11	7	11	6	2	1	3	1
VERTICAL GRADIENT OF THERMAL WIND	"	"	"	"	92	11	10	11	10	2	2	3	3
KINETIC ENERGY	"	"	"	"	70	11	6	11	10	2	1	3	1
KAT FIELD	"	"	"	"	59	11	7	11	7	2	1	3	1
LAPLACIAN OF VORTICITY	12 MAR 65	00Z	II	19	53	4	2	9	5	5	2	1	1
VERTICAL GRADIENT OF THERMAL WIND	"	"	"	"	89	4	3	9	8	5	5	1	1
KINETIC ENERGY	"	"	"	"	63	4	1	9	5	5	5	1	1
KAT FIELD	"	"	"	"	48	4	2	9	5	5	2	1	1
LAPLACIAN OF VORTICITY	12 MAR 65	12Z	I	26	77	15	10	11	8	0	0	0	0
VERTICAL GRADIENT OF THERMAL WIND	"	"	"	"	100	15	15	11	11	0	0	0	0
KINETIC ENERGY	"	"	"	"	88	15	13	11	10	0	0	0	0
KAT FIELD	"	"	"	"	92	15	14	11	10	0	0	0	0
LAPLACIAN OF VORTICITY	12 MAR 65	12Z	II	16	81	12	9	2	2	2	2	0	0
VERTICAL GRADIENT OF THERMAL WIND	"	"	"	"	94	12	11	2	2	2	2	0	0
KINETIC ENERGY	"	"	"	"	94	12	11	2	2	2	2	0	0
KAT FIELD	"	"	"	"	87	12	11	2	1	2	2	0	0

TABLE 4

	All Categories	LIGHT TO MODERATE	MODERATE	MODERATE TO SEVERE	SEVERE
TOTAL NUMBER OF KAT OCCURRENCES	302	165	103	28	6
(10 MARCH 1965 TO 12 MARCH 1965)					
PERCENT CORRELATION (BY FIELD AND CATEGORY)					
LAPLACIAN OF VORTICITY		65	71	71	67
VERTICAL GRADIENT OF THERMAL WIND		90	89	93	100
KINETIC ENERGY		70	76	78	33
KAT FIELD		72	70	60	50
PERCENT CORRELATION (BY FIELD)					
LAPLACIAN OF VORTICITY	68				
VERTICAL GRADIENT OF THERMAL WIND	90				
KINETIC ENERGY	76				
KAT FIELD	70				

TABLE 5

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13. ABSTRACT There is much disagreement as to (a) what causes clear air turbulence (turbulence which is not in or near convective clouds and is above 15,000 feet in altitude) and (b) which meteorological parameters can be used to detect and forecast its occurrence. The approach to this problem has been to relate not one parameter to clear air turbulence but various parameters. By summing these parameters areas can be defined where there is a high probability of encountering clear air turbulence. Each parameter has been based on a statistical study which found a relationship with clear air turbulence. The parameters used were horizontal and vertical shear, curvature, kinetic energy and their derivatives. The numerical forecasting program proposed here can be extended to the stratosphere when more reliable height and temperature fields are available. This program will have much more significance when intermediate forecast height fields, temperature fields and a grid of much smaller mesh length are available.			

14.

KEY WORDS

LINK A

LINK B

LINK C

ROLE

WT

ROLE

WT

ROLE

WT

Turbulence

Clear Air Turbulence

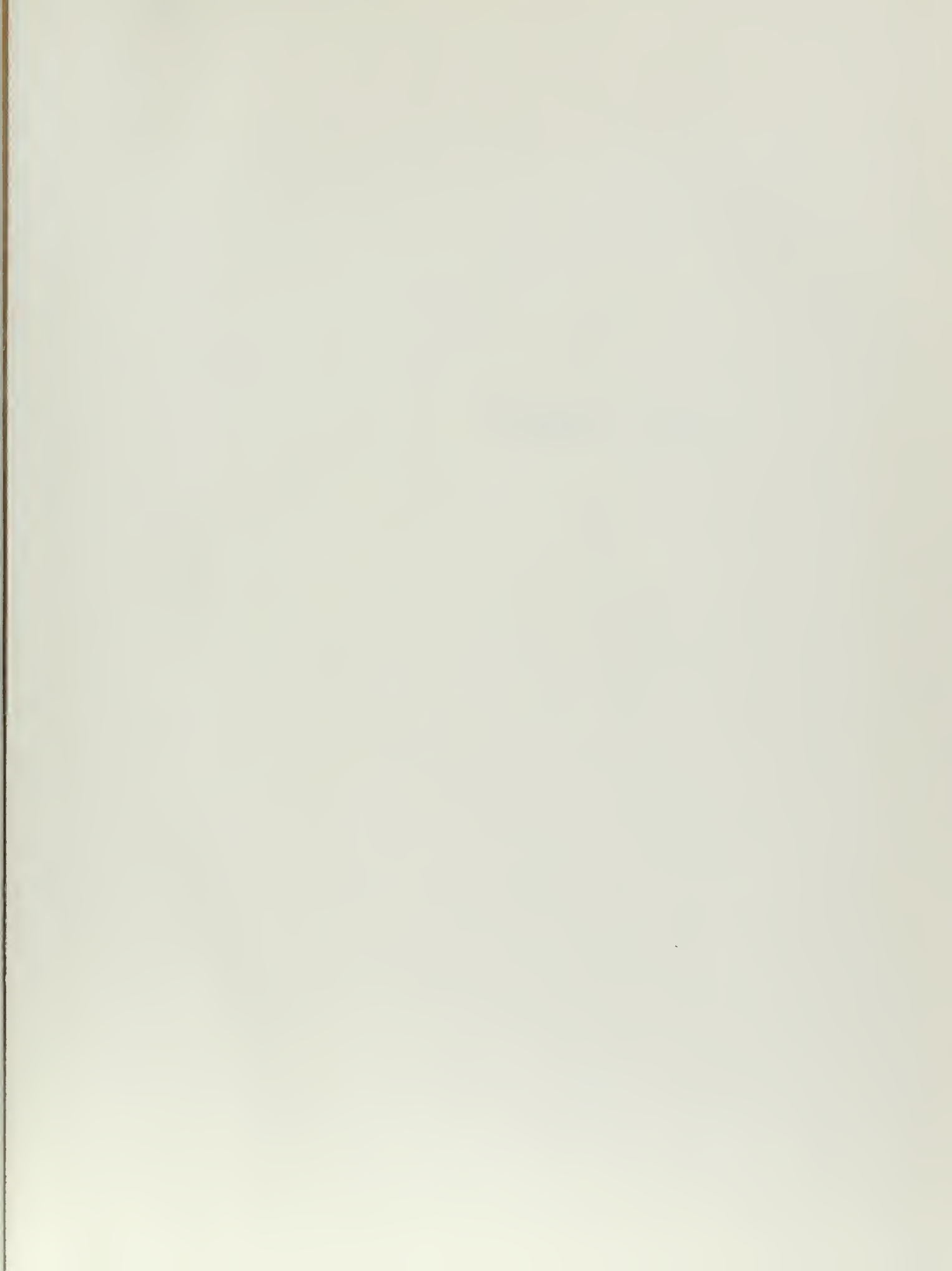
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